B 640518

MARCH, 1957

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

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Plating with Insoluble Anodes
Design of a Practical Replenishing Cell

Finishing Nickel and High Nickel Alloys
Polishing and Buffing Procedures

Determination of Lead in Lead Fluoborate Solutions
Rapid EDTA Method

Surface Treatment and Finishing of Light Metals
Plating on Aluminum - Zinc Immersion Processes

Porosity Detection in Plated Coatings
Non-Destructive X-Ray Method

Science for Electroplaters
Chemical Surface Preparation

Complete Contents Page 43

WESTWOOD, N. J.

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FINISHING PUBLICATIONS, INC.

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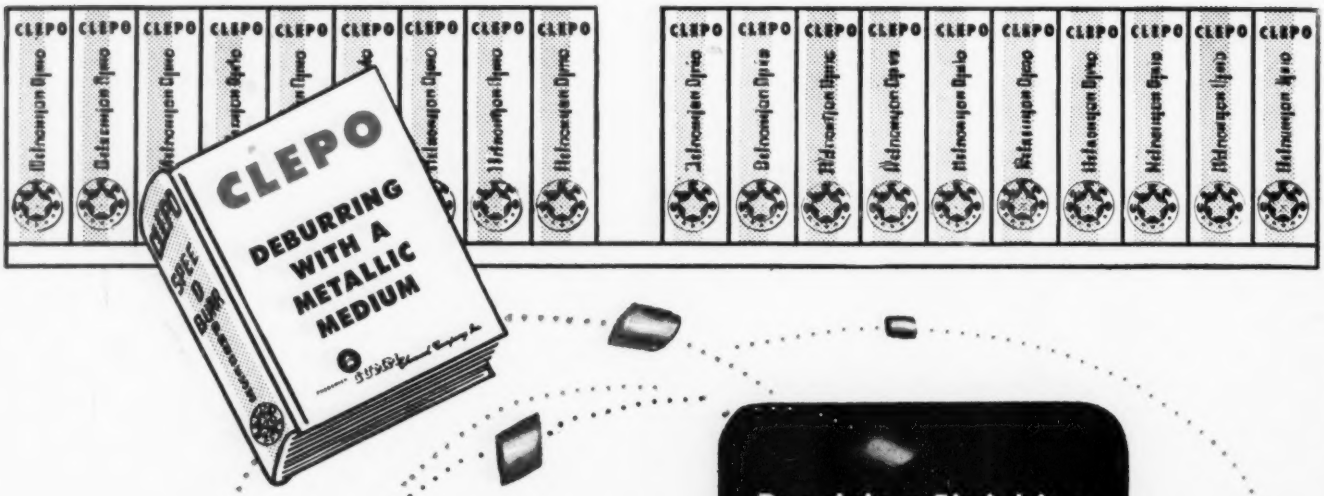

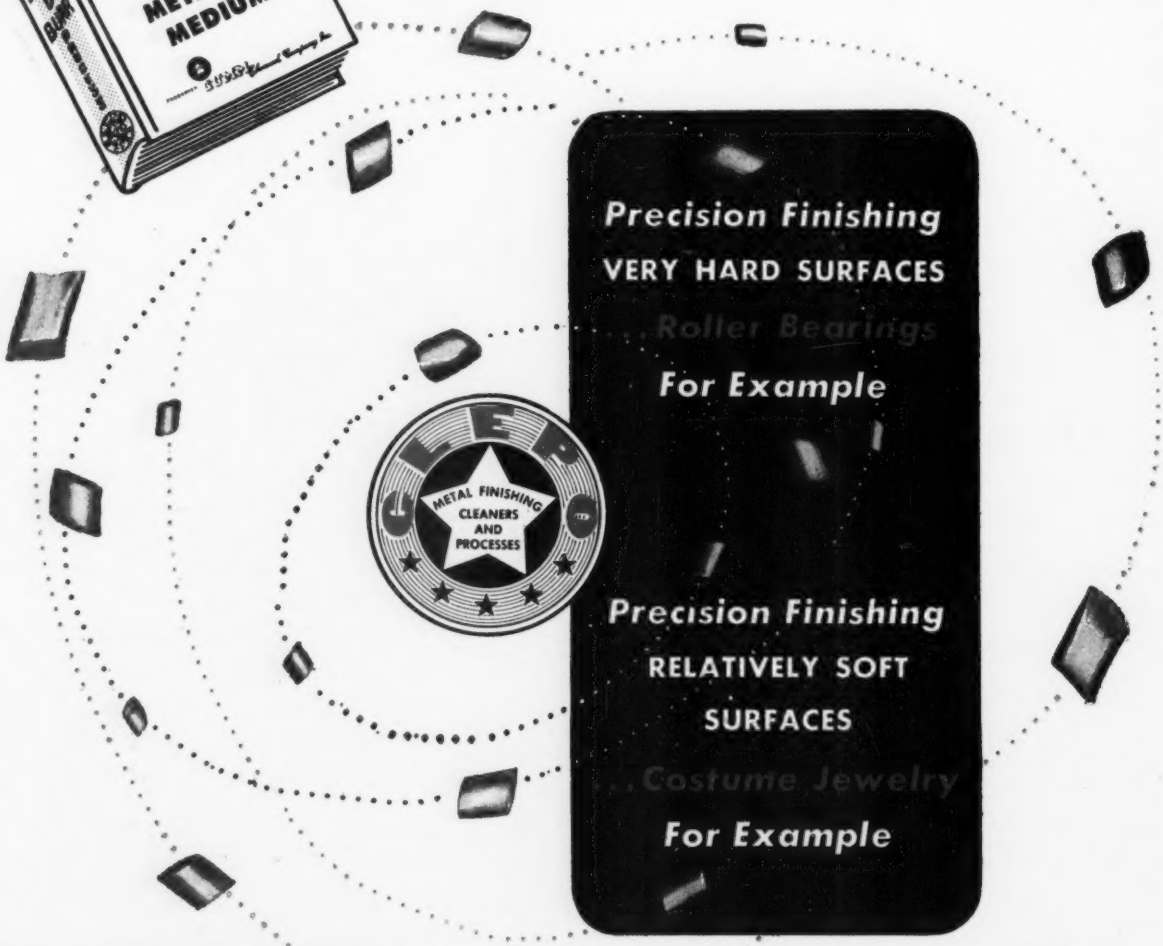

The CLEPO Spee-D-Burr Process can do both. It's exceptionally versatile. Using uniformly-sized zinc barrel-shaped slugs, this process produces a rather unique tumbling action. Contacts are surface to surface rather than point or edge to surface as is usually the case with non-metallic deburring media. Tendency to scratch, gouge or otherwise mar the surface is eliminated. Uniform high polish precision finishes can be obtained over a wide range of metal hardness — in one operation where the steels are concerned; followed by a ball burnishing operation on the non-ferrous metals.

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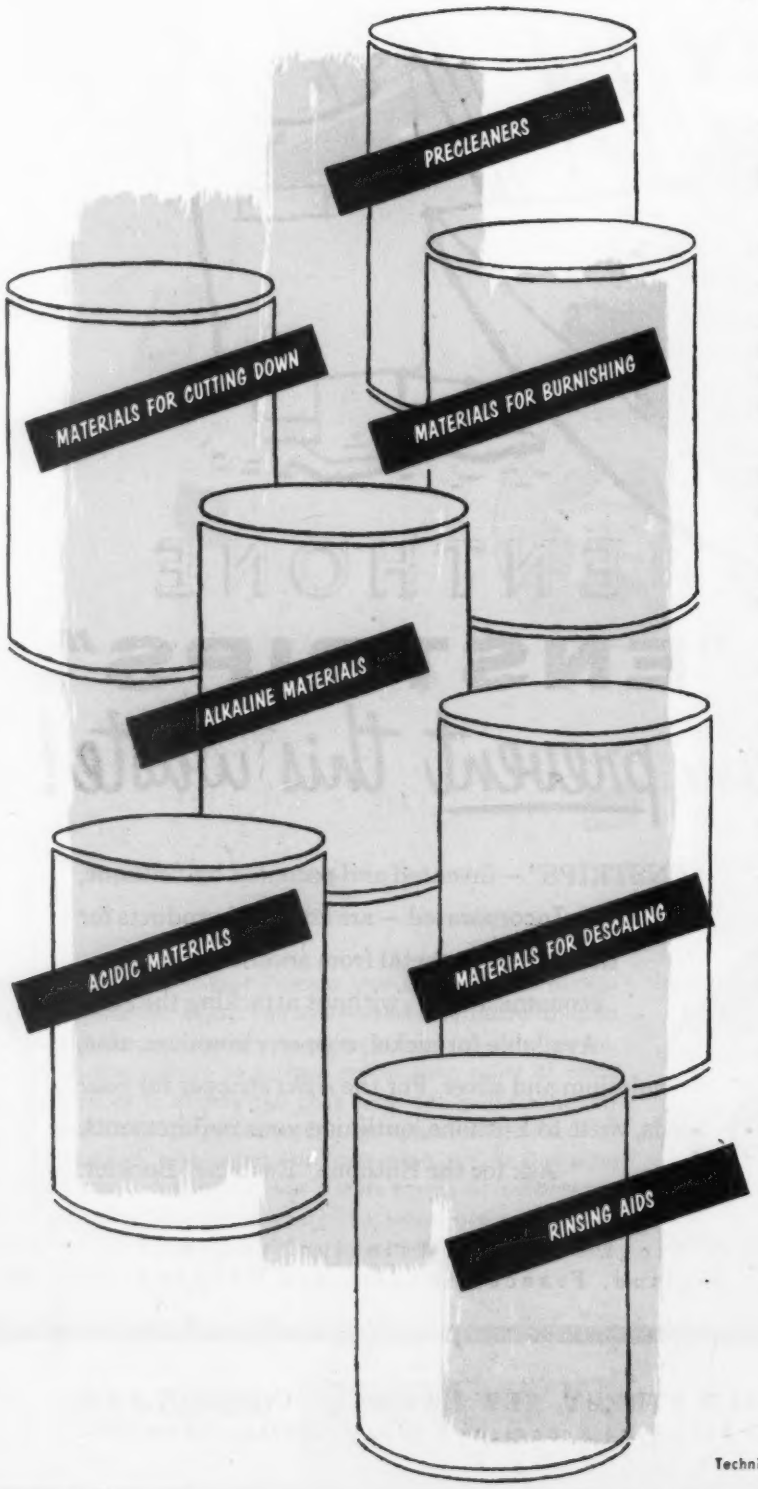

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Whether you are deburring or burnishing ...whether you're tumbling hard metal parts or soft metal parts, there's an Oakite compound just right for the job. Your local Oakite Man will be glad to advise which is best for your work.

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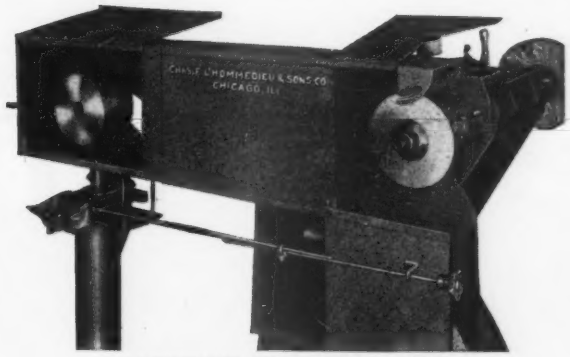

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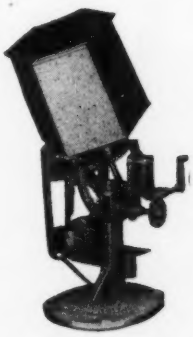
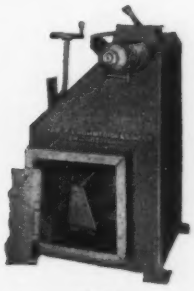


OBLIQUE
TUMBLING BARREL



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POLISHING LATHE

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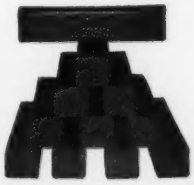

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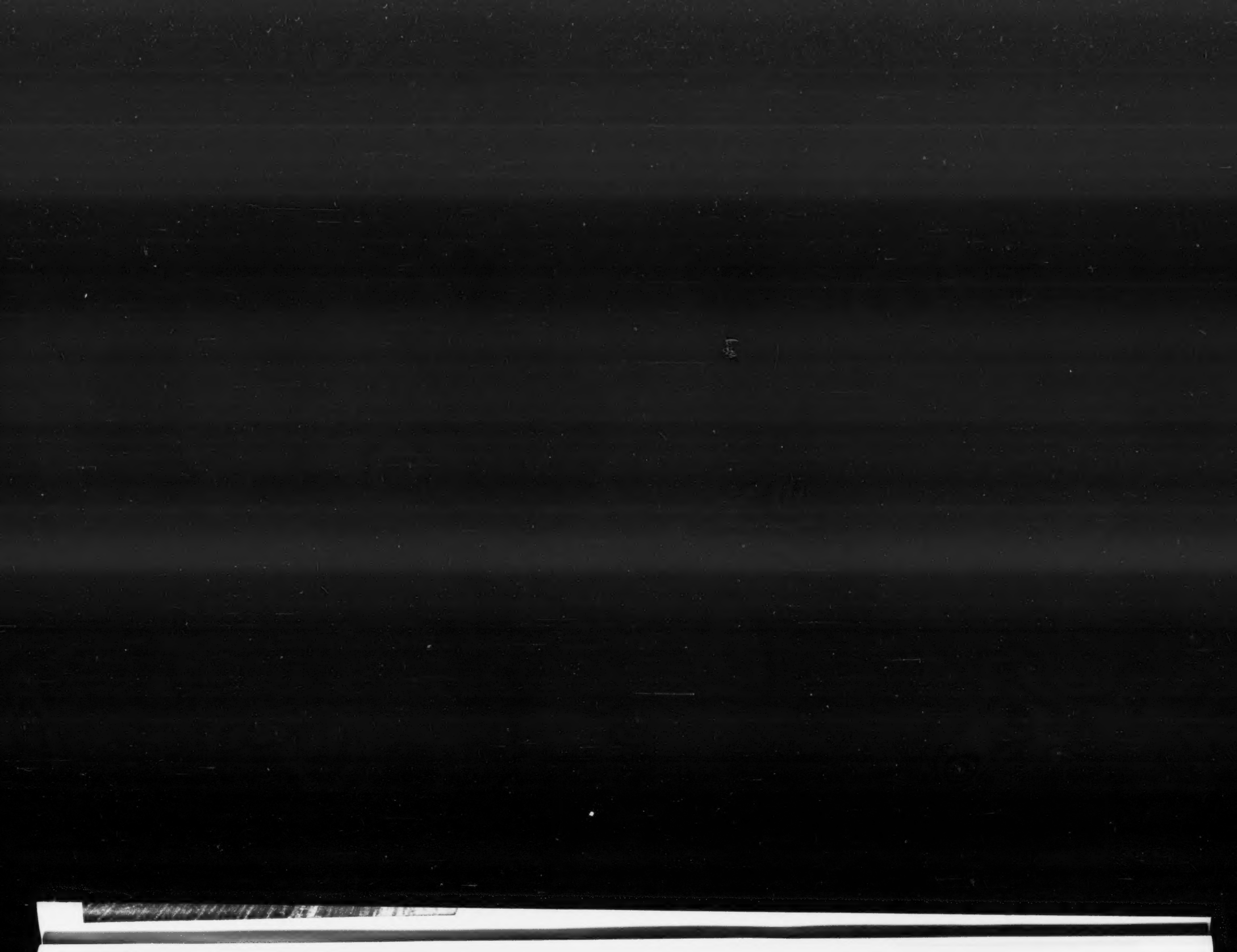

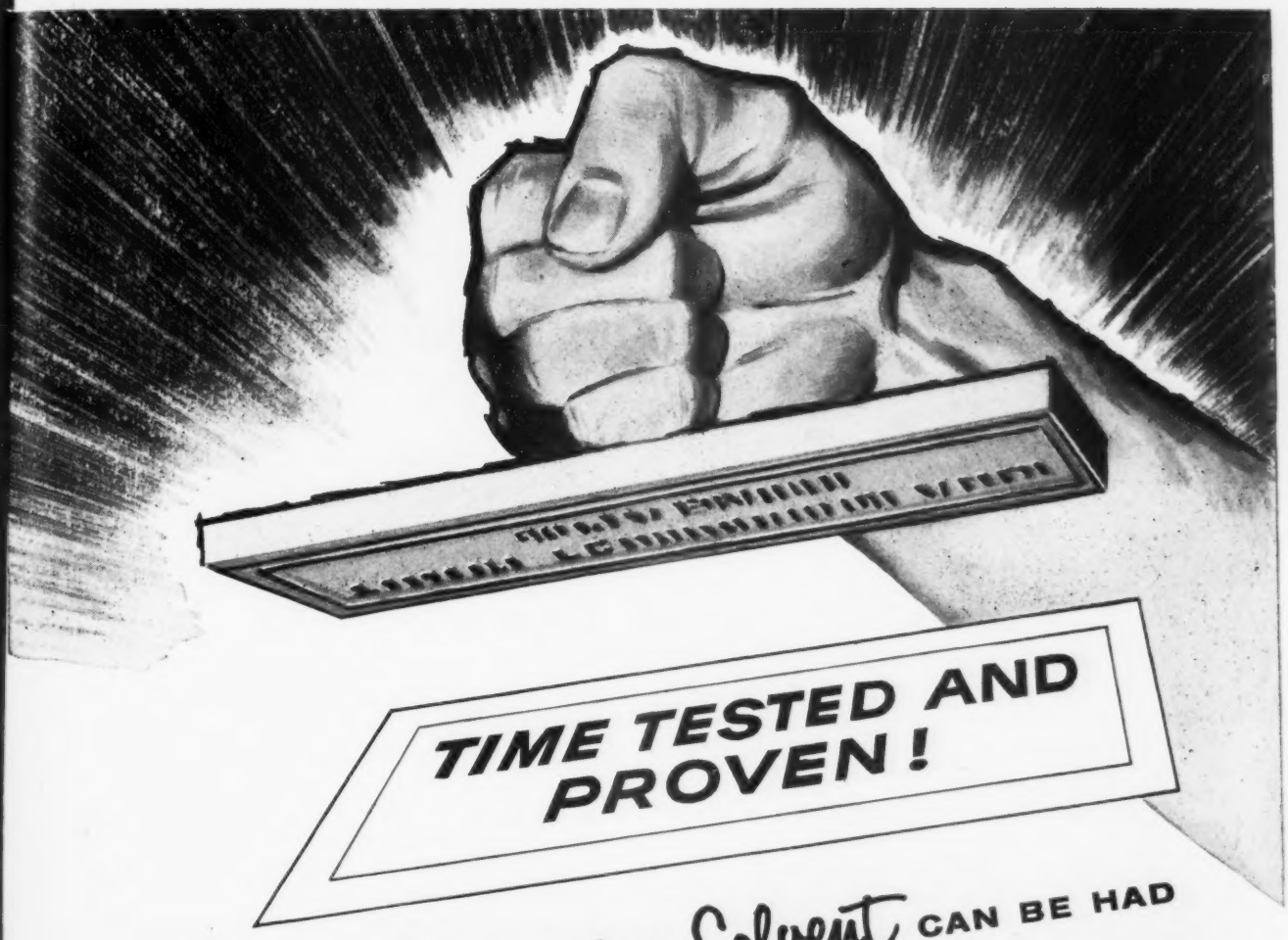

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A Timely Message on

Anticipating Industry Demand

by Ben P. Sax

Chairman of the Board, American Buff Company

1957 ushered in a galaxy of new models, new forms, new means of assembly in many products . . . from roller skates to automobiles. New problems, too, were thus ushered in for manufacturers faced with the need for economical production of parts and products.

The continued tightness in both labor and materials also requires new solutions to the problem of increasing the gross national output, to compete favorably with the continuing tight money outlook.

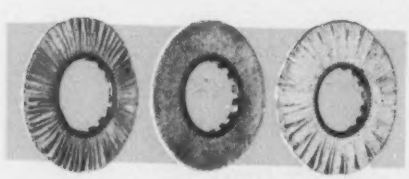
Fortunately, American free enterprise can "hold the lion by its tail" . . . because of the innate ability of business and science to "think ahead" of present needs. Anticipating industry's demand is a constant challenge to scientists, engineers and planners in all fields. Spurred on in 1956, not only by the trends within our own country, but also by the very real competition from foreign manufacturers, American ingenuity is constantly finding new ways to simplify production—to make one operation do the work of two (or more)—to adapt new and old materials to ever changing product applications.

Keeping a jump ahead of demand is an old, old story for American enterprise. It's the life blood that keeps us young, and eager, and progressive . . . tuned to the needs of tomorrow, and tomorrow's tomorrow. We can look forward to a "fifty-seven" of greater benefits for all of us . through more profitable operating methods and their resulting advantages to our customers . . . those indispensable millions . . . the ultimate consumers.

Sincerely,

Ben P. Sax

"For the job that's TOUGH—use an AMERICAN BUFF"



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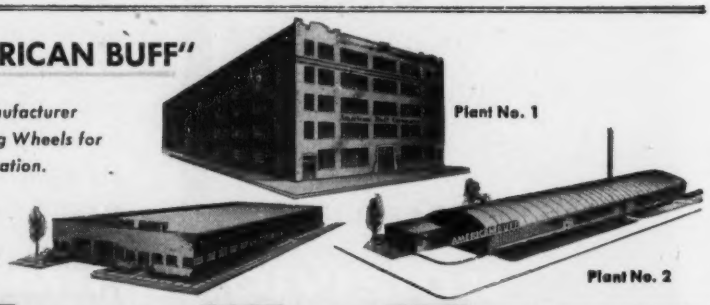

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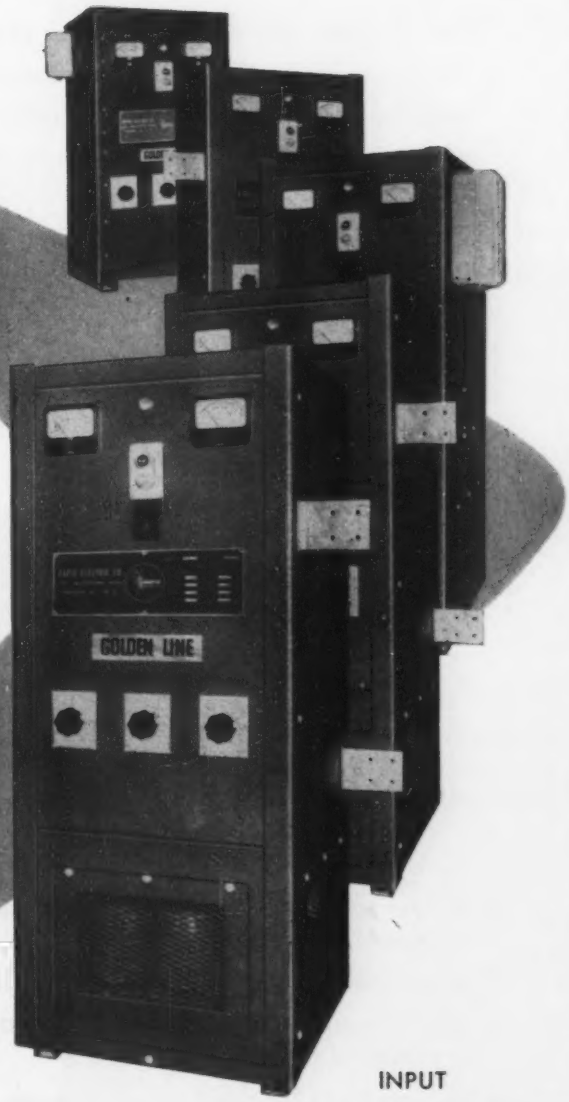

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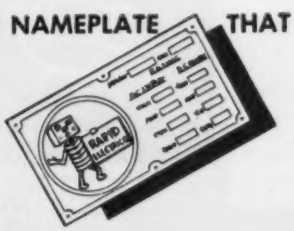

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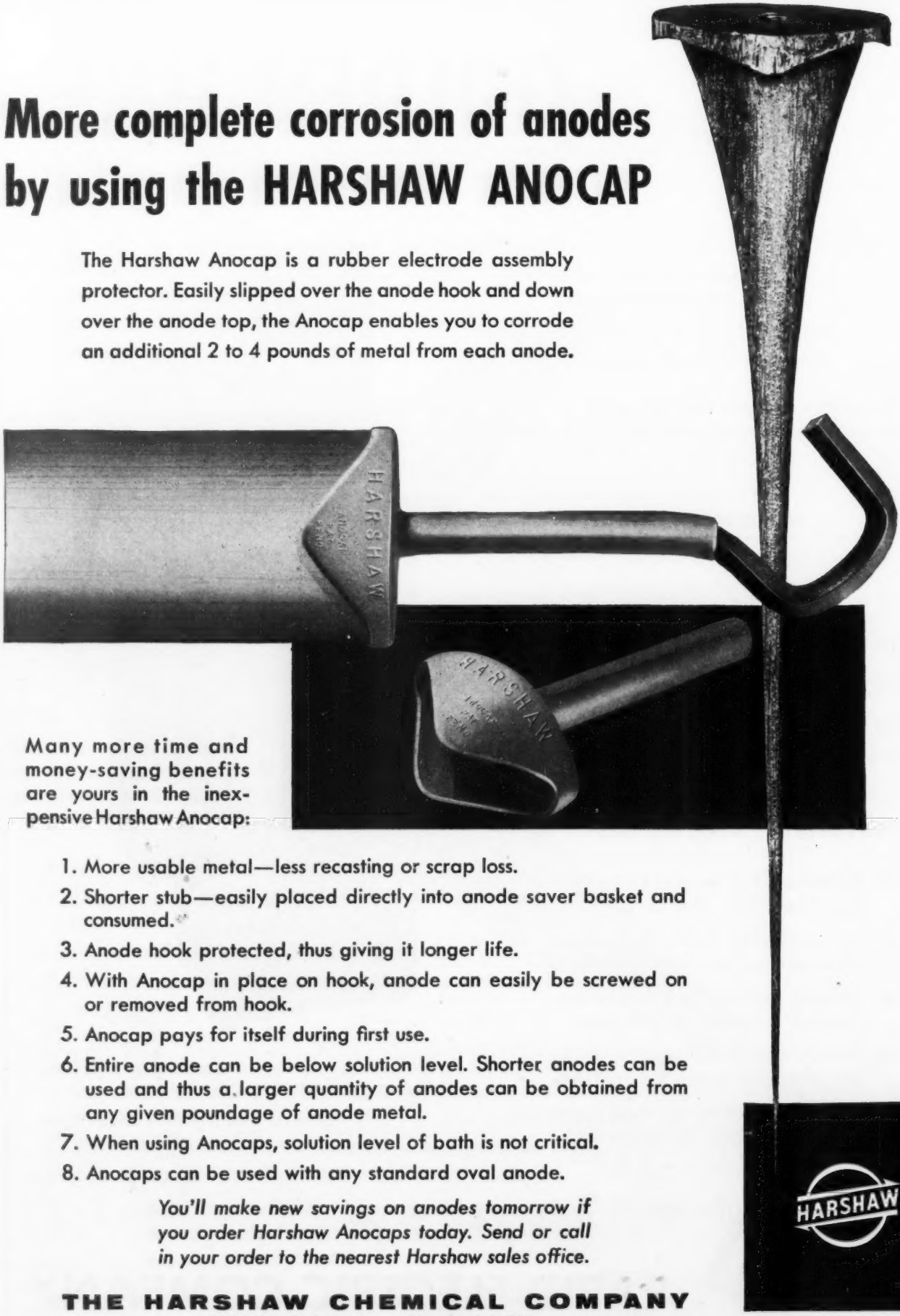

Many more time and money-saving benefits are yours in the inexpensive Harshaw Anocap:

1. More usable metal—less recasting or scrap loss.
2. Shorter stub—easily placed directly into anode saver basket and consumed.
3. Anode hook protected, thus giving it longer life.
4. With Anocap in place on hook, anode can easily be screwed on or removed from hook.
5. Anocap pays for itself during first use.
6. Entire anode can be below solution level. Shorter anodes can be used and thus a larger quantity of anodes can be obtained from any given poundage of anode metal.
7. When using Anocaps, solution level of bath is not critical.
8. Anocaps can be used with any standard oval anode.

You'll make new savings on anodes tomorrow if you order Harshaw Anocaps today. Send or call in your order to the nearest Harshaw sales office.

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- **First there is the use of one or more grades of Lea Compound to properly prepare metal surfaces for paint, lacquer or enamel adhesion.**
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- **LEA COLDSTRIP . . . non-toxic stripper used at room temperature; only minimum ventilation; can be filtered for continued recirculation.**

While Synstrip and Coldstrip do similar work, the choice depends upon volume of work, operating conditions, ventilation facilities, etc. We suggest that you outline your set-up and let our technical staff recommend which of the two would be better for your stripping requirements.

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. . . one reason is that in addition to its original excellence it is ably supported by Addition Agents of Blue Ribbon Quality

Consistently turning our copper plate which has become the quality standard of the industry at a surprisingly low cost, Lea-Ronal High Speed Bright Copper, with Lea Copper Glo as the key additives, should be investigated by every plant operating with cyanide copper. It offers so much in values that it should be tried. The vast majority of those who try it, adopt it.

Complementing this fine copper plating formula are several excellent addition agents; all helping to give top-notch performance:

ULTRATARTRAL

no burning; permits much higher current densities than with conventional coppers; higher free cyanide; sodium cyanide can be used at higher current densities; better anode corrosion; greater carbonate tolerance.

SUPERTARTRAL

primarily for barrel plating, far superior to Rochelle Salts or other tartrates.

WETTING AGENT CW-7

highly soluble additive which prevents deposition of metals on anode during idle time thus preventing Monday morning blues; increases bath tolerance to organics.

WETTING AGENT CW-6

low-foaming additive increases bath tolerance to organics in barrel plating.

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the best additive you can find for purifying baths containing chrome and other metal contaminants; particularly useful where zinc-chromium combinations exist.

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a well-proved process for providing all the values of Lea-Ronal Bright Copper with the exception of extreme brightness.

If you are interested in superior copper plate and high economy, you should make a thorough test of the Lea-Ronal High Speed Bright Copper Process. Set aside one tank and order enough for that tank. Give us your production schedule and we'll be glad to recommend the necessary quantity to make this comparative test.

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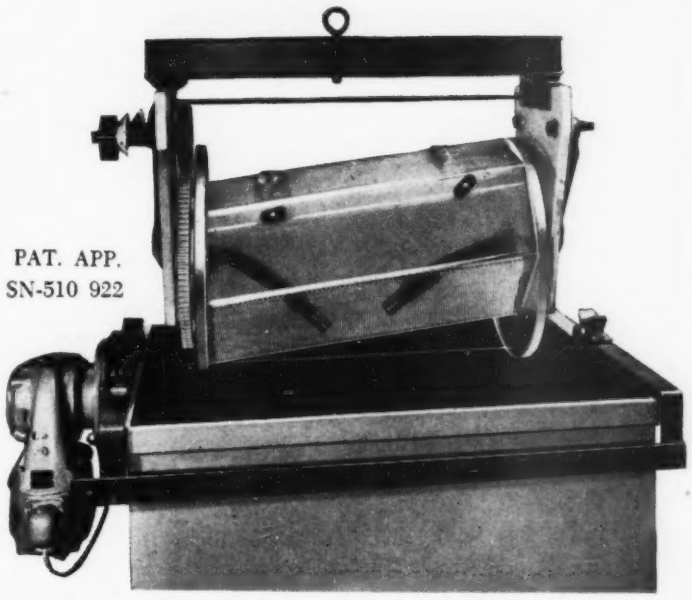
our guess is $100.00 per week per cylinder



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Uniform Plating makes the difference

With BELKE DOUBLE OSCILLATING CYLINDERS triple mixing action stirs, turns and moves the work across the cylinder. Every side of every piece gets uniform exposure to plating current.

You eliminate under-plating and over-plating. You don't have to over-plate most of the work to get the minimum deposit required on all the pieces.

You reduce plating time up to 20% with corresponding savings in plating metal and current.

What's more you turn out barrel plating quality never before equalled—avoid complaints, eliminate rejects, stripping and rerunning.

Modernize Your Plating Barrels with BELKE Rock and Roll Cylinders.

BELKE Double Oscillating Cylinders are available in all sizes from 14x36 regulars to 6x12 portables in complete plating units or to replace present cylinders.

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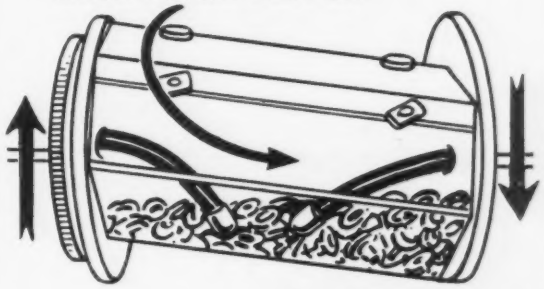
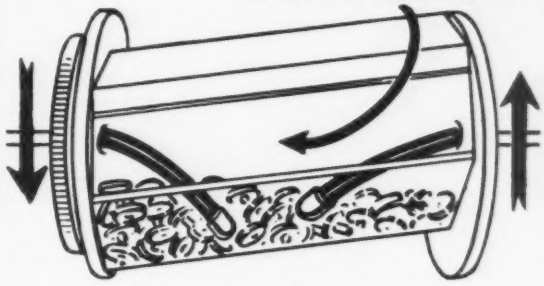
EVERYTHING FOR PLATING PLANTS

Each Revolution

work flows across

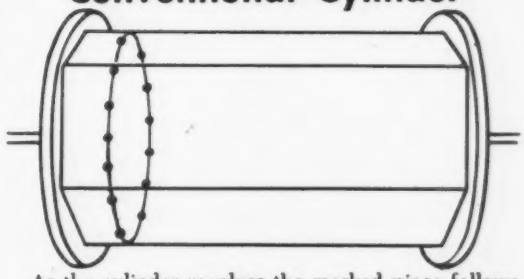


work flows back



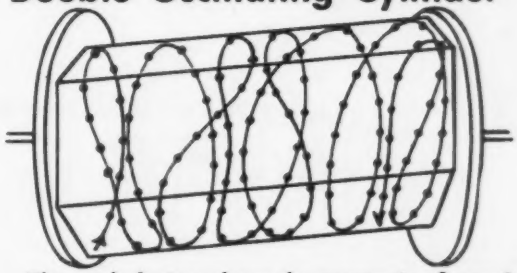
A marked piece shows the way the work goes!

Conventional Cylinder



As the cylinder revolves the marked piece follows a fixed path round and round the inside wall.

Double Oscillating Cylinder



The marked piece shows the progressive figure 8 mixing action added by double oscillation. The work pours back and forth as well as round and round.

Individual pieces move from end to end of the cylinder. They roll, twist and turn. None remains buried.

All sides of every piece are uniformly exposed to plating current. *That's why Double Oscillating Cylinders give you uniform plating deposit not obtainable with conventional cylinders, in less plating time and at reduced plating cost.*

MIGHTY COOL WAY TO CUT OR COLOR METALS...

WITH AHCO LIQUID BUFFING COMPOUNDS

Ahco Liquid Buffing Compounds are made with the same high-grade abrasives as Ahco bar compounds, but with an emulsion-type liquid binder. These versatile compounds may be applied in several ways: the work or the buff may be sprayed, or the work may be dipped or brushed before buffing. The amount of compound applied to a wheel or buff can be more easily controlled; buffs run cooler — thus eliminating a fire hazard and lengthening buff life. Work surfaces clean more easily; there are no nubbins left over, so you save compound. AHCO Liquid Compounds are especially suitable for automatic buffing

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DIVISION
HUBBARD-HALL CHEMICAL CO.
WATERBURY · CONNECTICUT

"You sure this Chlorothene solvent is safe, Chet?"

"Jess, that's one thing I'm *real* sure of."

"Well, I didn't want to be the first to find out."

"You aren't. Almost everyone knows Chlorothene® is the safe, effective cold cleaning solvent. You can use it for spray, dip, wipe or bucket cleaning."

"I was afraid it might be the kind that catches fire."

"Can't. Unlike petroleum solvents, it has no flash or fire point."

"How about toxicity?"

"It's a low toxicity solvent, too. Has an MAC rating of 500 ppm. In fact, our Safety Engineer recommended it."

"Guess that takes care of the safety angle."

"Yes, and Chlorothene really takes care of the cleaning angle, too. It's high in solvent power and evaporates fast."

"Say, Chet, did you invent this stuff?"

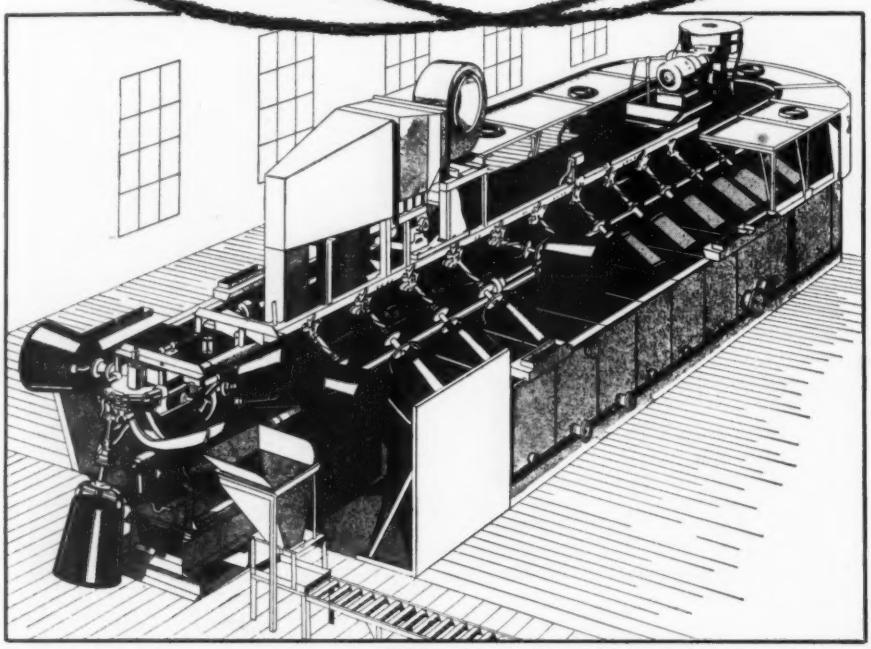
"Nope. Dow developed it."

"Who?"

"Dow. The Dow Chemical Company, Midland, Michigan. You know, the company that makes the complete line of chlorinated solvents—Dow Trichloroethylene and Dow Perchloroethylene Industrial for vapor degreasing, and Dow Methylene Chloride for stripping and cleaning metals. Why don't you write them for the whole story?"

YOU CAN DEPEND ON DOW

Barrel Plating by Stevens Really Cuts Costs



End View of Stevens Super "E" Automatic Barrel Plating Machine.

Since Stevens first introduced the Automatic Barrel machine scores of industries have enjoyed these operational advantages. Check them against your present operations.

MINIMUM LABOR REQUIRED — In most cases, one unskilled employee can operate the machine.

HANDLES THE COMPLETE CYCLE — Including cleaning, pickling, chromate treatments, plating, bright dip and drying.

COMPLETELY AUTOMATIC — No barrel lids to fasten and unfasten during automatic loading and unloading.

BETTER HANDLING — No mixing of parts. Becomes a part of a straight line production system.

NO HEALTH HAZARD — Occupational health hazards eliminated with ventilation of equipment.

UNIFORMITY OF PLATE — Accurate plating cycles timed to meet your requirements.

FITS ANY PLANT LOCATION — Does not need special buildings—Can be moved at any time. Low head room.

DEPENDABLE — Scores of machines in use. Machine design and construction constantly improved.

LOW INITIAL COSTS — For average operation lowest initial machine costs.

LOW MAINTENANCE COSTS — Proven over years of use and in varied operations.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

Let a Stevens Sales Engineer show you how you can cut costs in your plating operation with a Stevens Automatic Barrel. Write us direct. Frederic B. Stevens, Inc., 1816-18th Street, Detroit 16, Michigan.

METAL FINISHING EQUIPMENT AND SUPPLIES, FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

BRANCHES:

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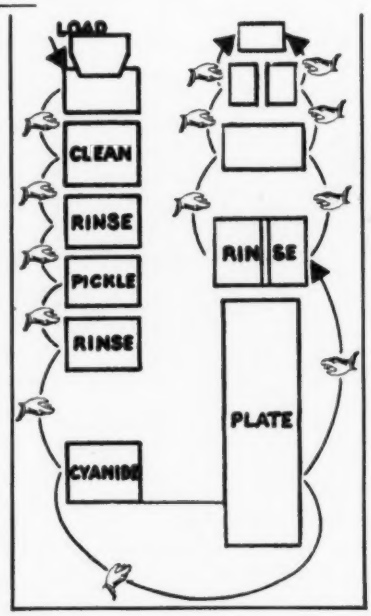
HOW AUTOMATIC BARREL PLATING CAN REDUCE YOUR HANDLING AND BURDEN COSTS—

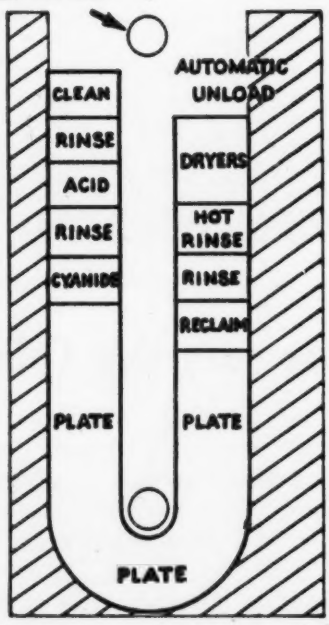
Compare this

Conventional Horizontal Barrel Line



With this

Stevens Automatic Barrel Installation



Production from *both* installations is the same.

Notice how many more handling steps (indicated by the illustrated hands) and manual load-unload operations (indicated by the arrows) are required for the manual set-up.

Notice, too, how much floor space (indicated by shaded area) is saved with a Stevens automatic installation. No manual operations required with automatic load and unload.

BALANCED QUALITY *

Keeps MICCROSOL on top

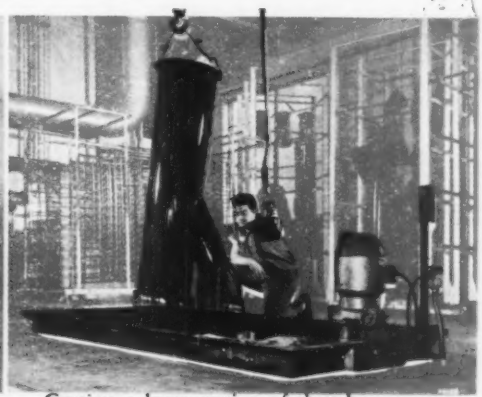
Developed originally as a coating for plating racks, Miccrosol E-1003 has all the desirable characteristics which make it an ideal coating for many other applications.

The chemical resistance of Miccrosol is unequalled in its field. Its toughness, abrasion resistance, resilience, and flexibility are unsurpassed. It's easy to apply in either a *dip* or *spray* formula. When necessary, it's easy to repair.

Year after year we build this quality into Miccrosol, improving it whenever possible and practicing every economy in its manufacture that does not compromise the excellence of the product.

This BALANCED QUALITY enables you to use Miccrosol *profitably* while assuring your customers of coating jobs that will prove superior in their performance.

Spark testing a large plating tank coated with Miccrosol Spray S-2003.



Coating a large section of duct by dipping in Miccrosol E-1003.

*Outstanding performance and value

BALANCED QUALITY

MICHIGAN CHROME *and Chemical Company*

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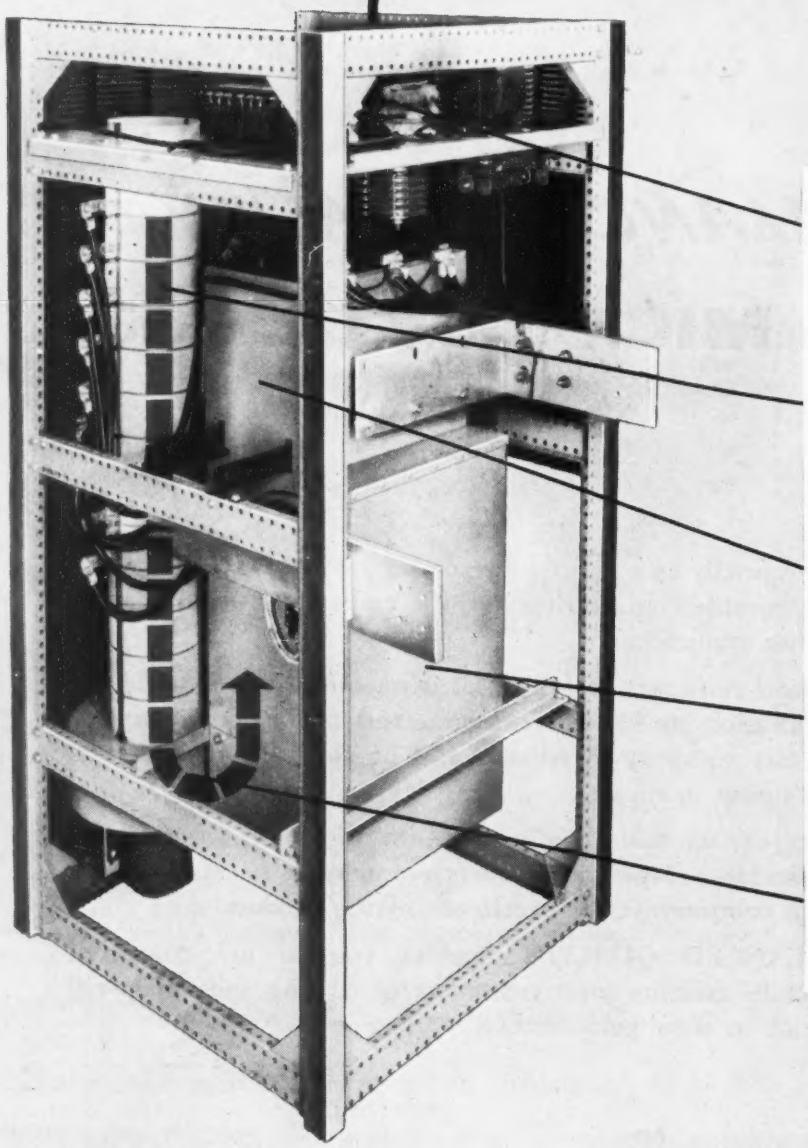
Miccrosol Products

Developed and manufactured by experienced platers and coaters

FOR TANKS, DUCTS, AND OTHER EQUIPMENT



Automatic voltage control contains no moving parts or electronic tubes.

This tube contains time-proven General Electric germanium cells, each hermetically sealed in stainless-steel-ceramic enclosure for maximum corrosion resistance.

Transformer, protected by double-impregnation with alkyd-resin finish.

Reactor provides instant, stepless control plus built-in short-circuit protection.

Powerful blowers supply high-velocity cooling air blast (red line) past cells, through reactor and transformer.

General Electric announces a

TO: GENERAL ELECTRIC COMPANY
Section 463-15, Schenectady 5, N. Y.

Gentlemen:
Please send me bulletin GED-2934, "General Electric Automatic Germanium Plating Rectifier."

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Progress Is Our Most Important Product

GENERAL ELECTRIC

RELEASE THIS MAN FOR MORE PRODUCTIVE WORK . . . no further need for him to continually correct output in order to get high-quality work. Just set it and forget it. This unit corrects faster, more accurately than the most-skilled operator. You get uniform power for most profitable plating.

NEW line of low-priced automatic germanium plating rectifiers

Examples: 9-volt/1500-amp, $1890; 12-volt/1000-amp, $1750

COMPLETE with remote automatic voltage control

Here's the biggest advance in plating rectifier technology since the introduction of germanium: *automatic control at low prices*!

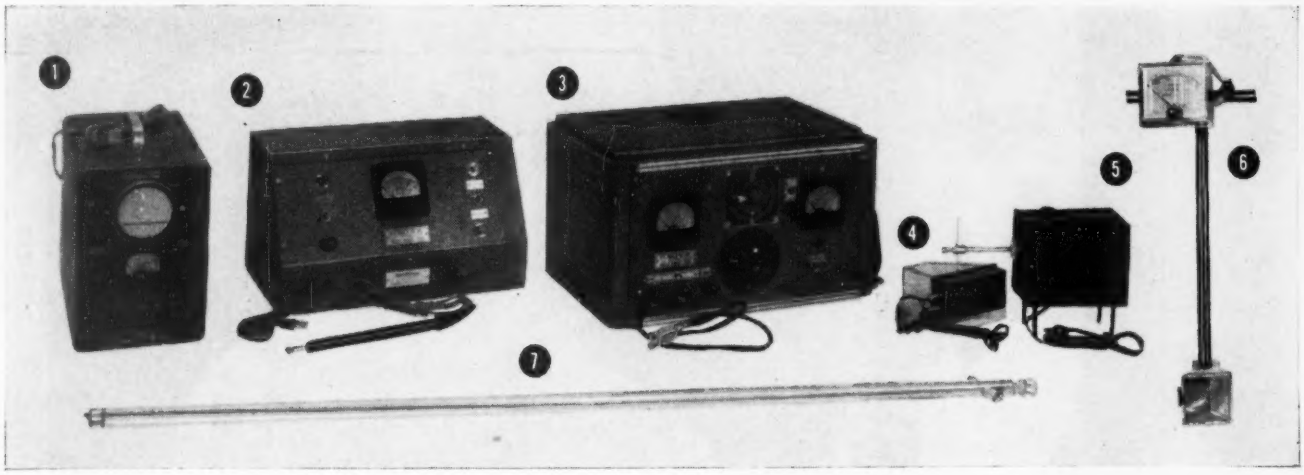
With automatic control, you simply set the output you want on the remote-control panel. This output is maintained automatically, regardless of changes in tank load or variations in a-c input voltage. The result is a uniform product from rack to rack—not too much deposition, which wastes valuable anode material, time, and labor; not too little deposition, resulting in costly rework.

The low price results from: (1) successful adaptation to plating equipment of a low-cost saturable reactor circuit, long recognized as the ideal control; and (2) the perfection of a new cooling technique which cools the germanium cells from *both* sides and force-cools the reactor and transformer for long life.

Ratings *are now being built* from 6-volt/750-amp to 250-volt/140,000-amp, air-cooled and water-cooled. Ask your General Electric plating equipment supplier for more information, or send in the coupon for bulletin. General Electric Co., Schenectady 5, N. Y.

FOR A TO Z CONTROL

. . . use the Newest Rohco® Equipment!



1 MODEL C-3 CURRENTESTER—affords the ONLY SURE way of detecting and correcting hidden rectifier defects that may decrease electrical efficiency, slow down production, or give poor quality plating.

2 ANODICATOR THICKNESS TESTER—automatically determines thickness of anodic coatings on aluminum as specified in ASTM B110-45. Essential for every aluminum anodizing plant.

3 MODEL B1000-1-1 HULL CELL RECTIFIER—has unusual refinements, accuracy and simplicity of operation for laboratory or bench plating. Output: 30 amps. D. C., at 13 volts for general use, or 6 amps. D. C., at 18 volts for Hull Cell use. Full wave rectification with output filtered to give 3% ripple; powerstat voltage control from zero to full voltage; dual ammeter; voltmeter.

4 LUCITE MODEL "WT" 267 ml. HULL CELL—with quartz heater and built-in thermostatic control; for all plating baths except chrome.

5 THREE SPEED HULL CELL AGITATOR—simulates cathode rod agitation in the Hull Cell by means of reciprocating motion of its paddle.

6 NEW MODEL HANGING HULL CELL—catches plating troubles at the source by spot checks. Just suspend the cell on the cathode busbar (as you hang a rack of work). Adaptable to any type of still or automatic plating.

7 SAMPLING TUBE—unbreakable lucite. Designed for perfect sampling of plating baths without mess or fuss.

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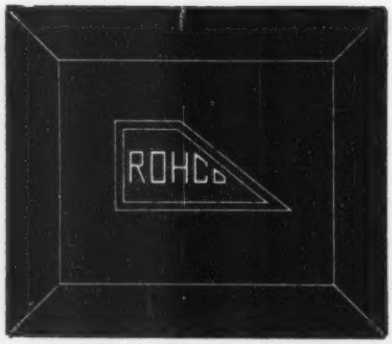
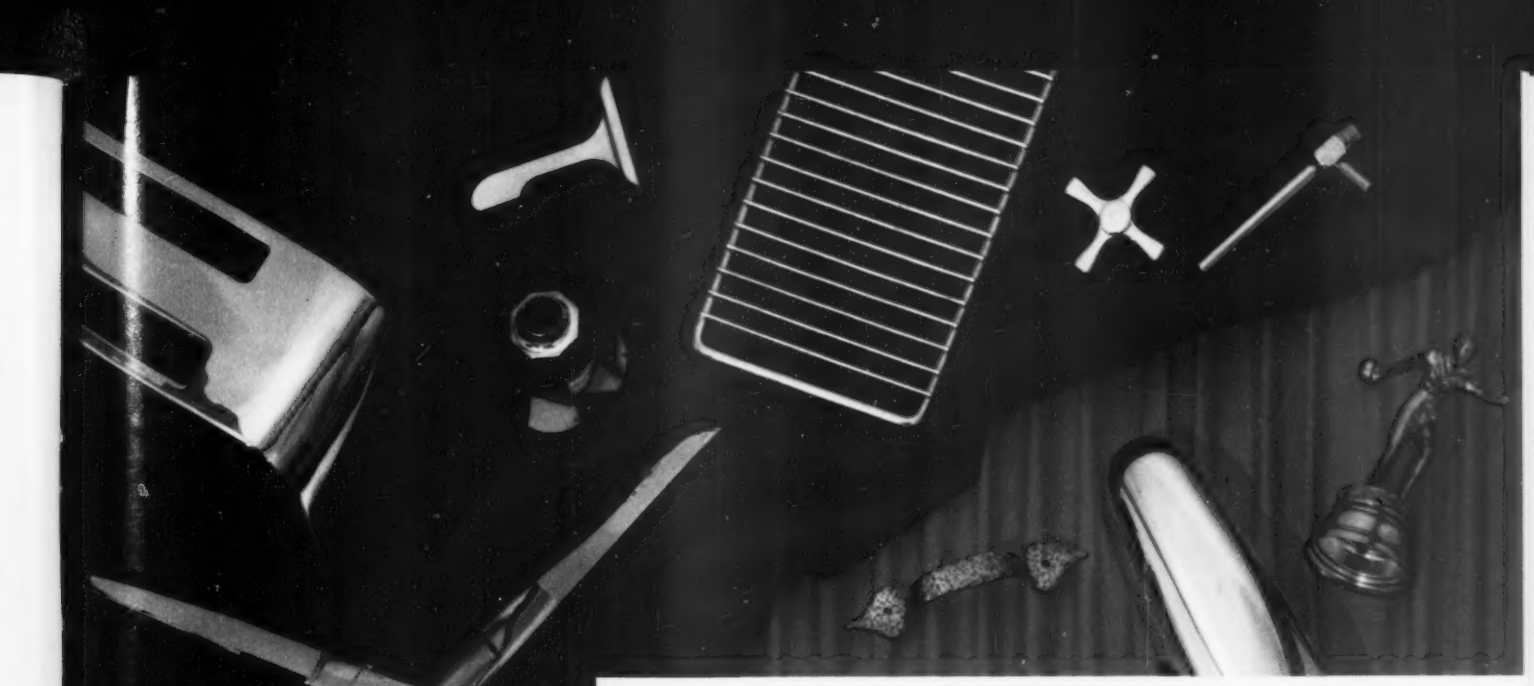


OTHER FAMOUS ROHCO PRODUCTS: For Cadmium Plating—ROHCO SUPER XL CADMIUM BRIGHTENER, RODIP CD-3 and CD-4, CAD-SOL, CADIP; For Zinc Plating—100 and 150 BARREL ZINC BRIGHTENER, 503 STILL ZINC BRIGHTENER, PERMA-BRITE BARREL AND STILL ZINC BRIGHTENERS, ZINC PURIFIER; For Chromium Plating—SUPER NO-CRO-MIST®; For All Plating—RINS-AID®, HULL CELL ANODES AND CATHODES.

"The Hull Cell Test Makes Plating Best"



All these and many more products can be finished less expensively with this plate

New Bronze Plating Discovery

eliminates buffing

...excellent corrosion resistance minimizes need for nickel

Here's a revolutionary advance in electroplating—"Bright LUSTRALITE 10," a new process that gives you several important advantages.

The plate has remarkable leveling power, with a true bright finish that needs no buffing or polishing. Its outstanding corrosion resistance makes it an excellent substitute for nickel. It eliminates the need for a copper plating and can replace all or most of nickel plating normally required.

"Bright LUSTRALITE 10" produces a brilliant bronze that's fine-grained and hard . . . practical for both decorative and corrosion-protective purposes. Learn for yourself how it can help you speed plating operations, cut production costs and improve your products. It's available through the same distributors that handle other Battelle processes listed on the opposite side of this page.

. . . For more information about Battelle-developed processes, get in touch with any of these authorized Battelle Development Corporation distributors. Each is fully equipped to give you complete data and technical help.

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Be sure to read about "Bright LUSTRALITE 10" on the opposite side of this page . . .

other Battelle Processes that simplify plating, add beauty and improve products

Electropolishing

A wide range of finishes is available. Gives products new sales values. Extraordinary smoothing action produces a micro-polished effect. "True metal color" is achieved with a lustre not attainable with belts or wheels. Metal surfaces remain undamaged.

Electrodeburring—*A variation of electropolishing, excellent for smoothing sharp, burred metal for safe handling and precision functioning. Indispensible for parts having burrs in hard-to-reach places. For many items, electroburring plus electroplating produces the best possible and most economical finish.*

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Smooths as it brightens. Won't etch. Brings out basic lustre. Especially suitable for small parts and those of intricate design. Can be plated over. Easy to install and operate . . . requires only a tank and heating element.

STANDARD Bright Nickel

Produces mirror-like surfaces. Has excellent leveling action, ductility, and corrosion resistance. Very hard (Knoop 500-580) and wear resistant. On 18-gauge steel, can be bent around a ½-inch radius without cracking.

Tin Immersion

Coats copper and a variety of brasses and bronzes against "green water." Coats wires against corrosion. Easily controlled cold bath.

LUSTRALITE Electroplating Processes also include LUSTRALITE 20, a rich golden plate; LUSTRALITE 10, a deep bronze red; and LUSTRALITE 45, silver white, of sterling appearance. Data upon request.

Please let me have more information. I am particularly interested in the following Battelle processes:

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Send brochure on new fully automatic Cycleflex.

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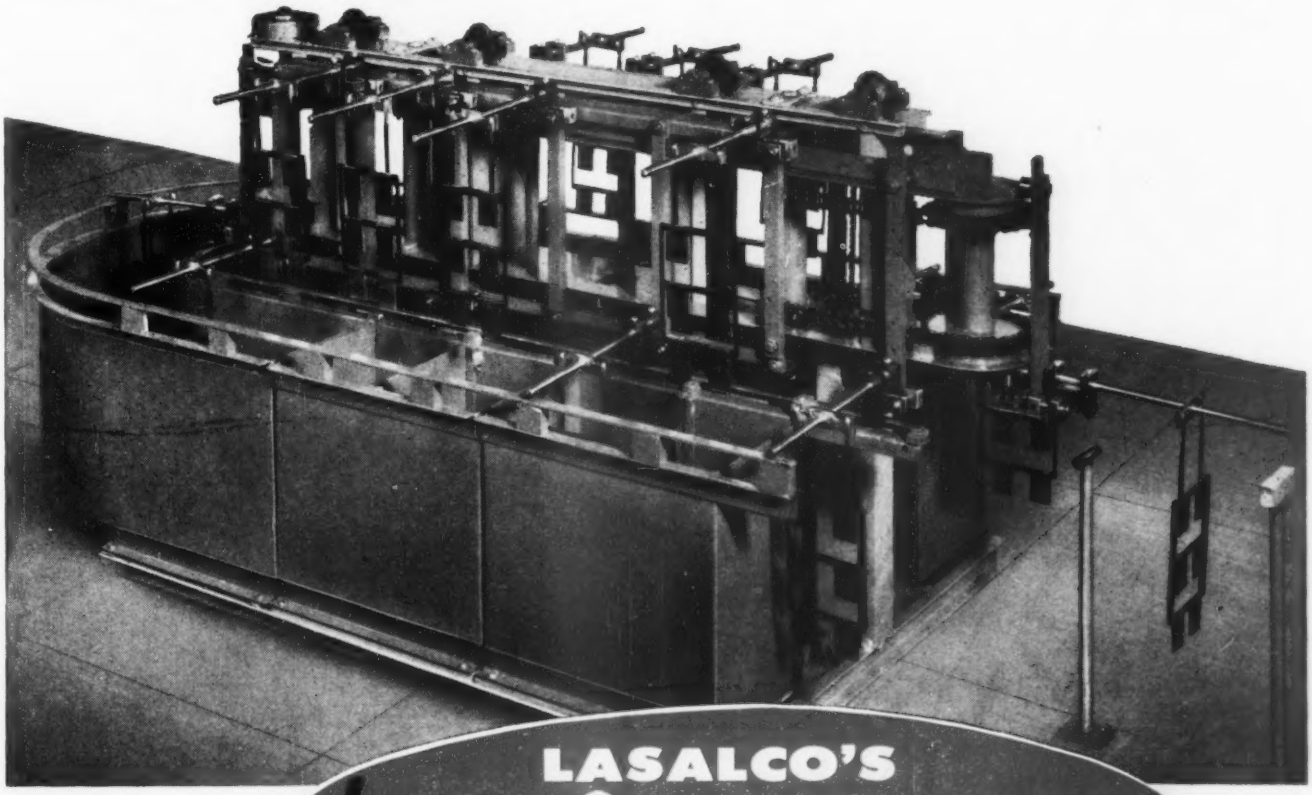
Signed.....



New! LASALCO'S Cycleflex

- Cycle changing requires no costly overhaul or rebuilding. Only the positions of pick-up heads need be moved, plus minor tank partition changes.
- New, simple electro-mechanical control and safety device eliminates all possibility of conveyor failure . . makes it impossible to push racks into side of tank prevents load from dropping if power fails during work transfer.
- Unusually low headroom required because no elevating mechanism operates above rack carrier.
- Self-cleaning heavy duty contacts have positive 3-point connection . . . need practically no attention.
- Easily removable rack carriers leave tank surfaces clear . . . an advantage in servicing and in manual plating of large pieces.
- Automatic loading and unloading of parts from standard double-spine racks is available . . . parts can be automatically unloaded while racks stay on machine.

Hydraulic operation, standard; pneumatic operation, optional.

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Famous FIRSTS

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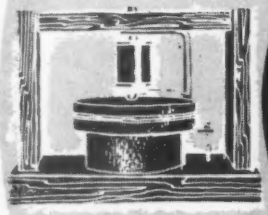
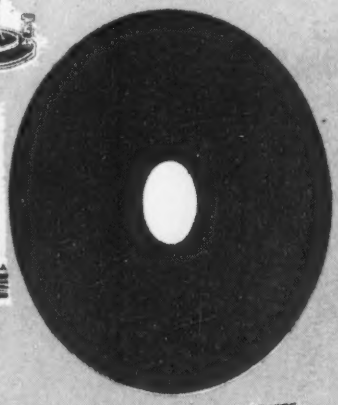
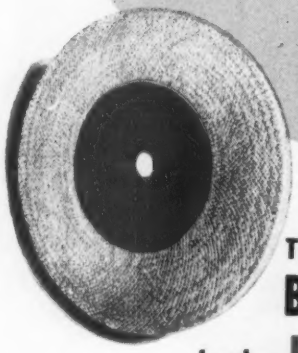




The **FIRST** TELEPHONE by Alexander Graham Bell

The **FIRST** AIRPLANE by the Wright Brothers



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Holders of the *Original* Bias Sisal Buff Patent No. 2642706

Specialized know-how and the demands of modern industry . . . these bring progress. The vision of a cool-running, fast-operating buff adaptable to various requirements led to the first Sisal Buff by the JOE-D Buff Co. The amazing efficiency and economy of JOE-D "Fray-Proof" Bias Sisal Buffs marks them as *leaders* in the industry. Specify JOE-D—the *Original* Bias Sisal Buff—for every requirement.

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UNIFORM DIMENSIONS — NO TAPERING — Dimensions are same at bottom and top . . . means larger capacities than tapered molded tanks.
FLANGES, DAMS, Etc. — Can be inexpensively equipped with flanged connection, holes, overflow dams, baffles, separations, etc.
CHEMICALLY RESISTANT THROUGHOUT — Fabricated from ***iolyte*** sheet properly reinforced. This is a structural material . . . not a lining.

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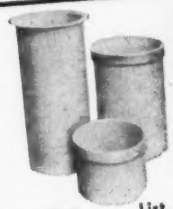
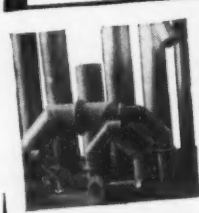


PRICE LIST

Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost	Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost
5	10"	16"	18.00	26	18"	24"	48.00
8	10"	24"	24.00	30	18"	30"	59.00
9	12"	18"	24.00	40	18"	36"	65.00
12	12"	24"	26.00	40	22"	24"	60.00
12	14"	18"	28.00	58	22"	36"	84.00
16	14"	24"	35.00	78	22"	48"	108.00
24	14"	36"	50.00	64	28"	24"	80.00
10	16"	12"	26.00	95	28"	36"	110.00
12	16"	14"	29.00	125	28"	48"	149.00
15	16"	18"	36.00	88	33"	24"	110.00
20	16"	24"	44.00	173	33"	48"	200.00
30	16"	36"	60.00	104	36"	24"	119.00
20	18"	18"	40.00	205	36"	48"	225.00



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iolyte has greater resistance to chemical attack than stainless, Monel, or aluminum. 1/5 the weight of steel, it is superior in tension, flexural, and compression strength. Unlike thermoplastics ***iolyte*** will not heat-distort below 350 deg.

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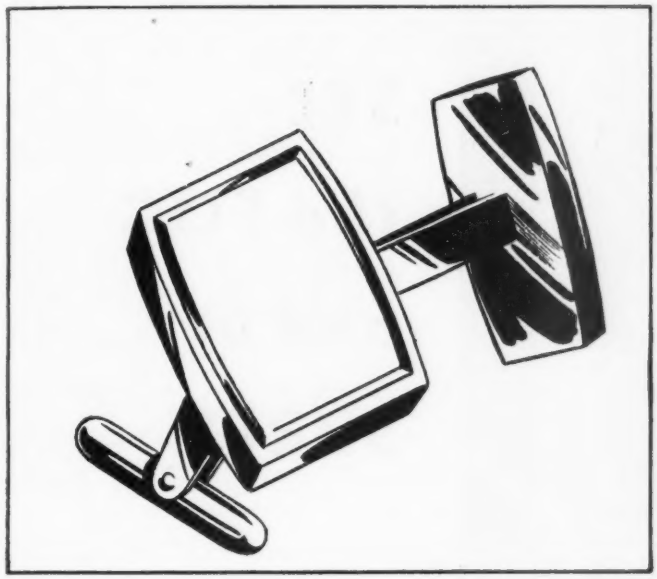
from cuff links...to automobiles



. . . there's a Wyandotte electrocleaner to meet your plating requirements!

Whatever your electroplating operation — from hand line to full automatic . . . from extremely small items to large and bulky products—you can be sure of economical, efficient results with Wyandotte electrocleaners!

Wyandotte's complete range of electrocleaners are not just thrown together, but evolved from extensive research; have proved themselves effective through use by leading manufacturers.

- **F.S.*** — A superior, heavy-duty reverse-current electrocleaner, noted for exceptional detergency. Features high conductivity, rapid smut removal, controlled foaming, and free rinsing.
- **No. 90** — An excellent, heavy-duty reverse-current electrocleaner, combining exceptional properties of smut removal, chrome tolerance, and controlled foam. It is unique among electrocleaners, in that it also cleans and brightens copper parts, or buffed copper plate.
- **B.N.** — Versatile electrocleaner for direct and reverse cleaning. It is free-rinsing, has high soil tolerance, and is non-dusty. Used by job shops everywhere for all-purpose electrocleaning.
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Your Wyandotte representative is a metal-cleaning specialist, prepared to provide complete technical data on these products and their uses. He will be happy to work with you on production tests as they apply to your operations.

His product knowledge and metal-cleaning experience, backed by the finest research and product development, can help you improve quality and reduce costs! Call him in, today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

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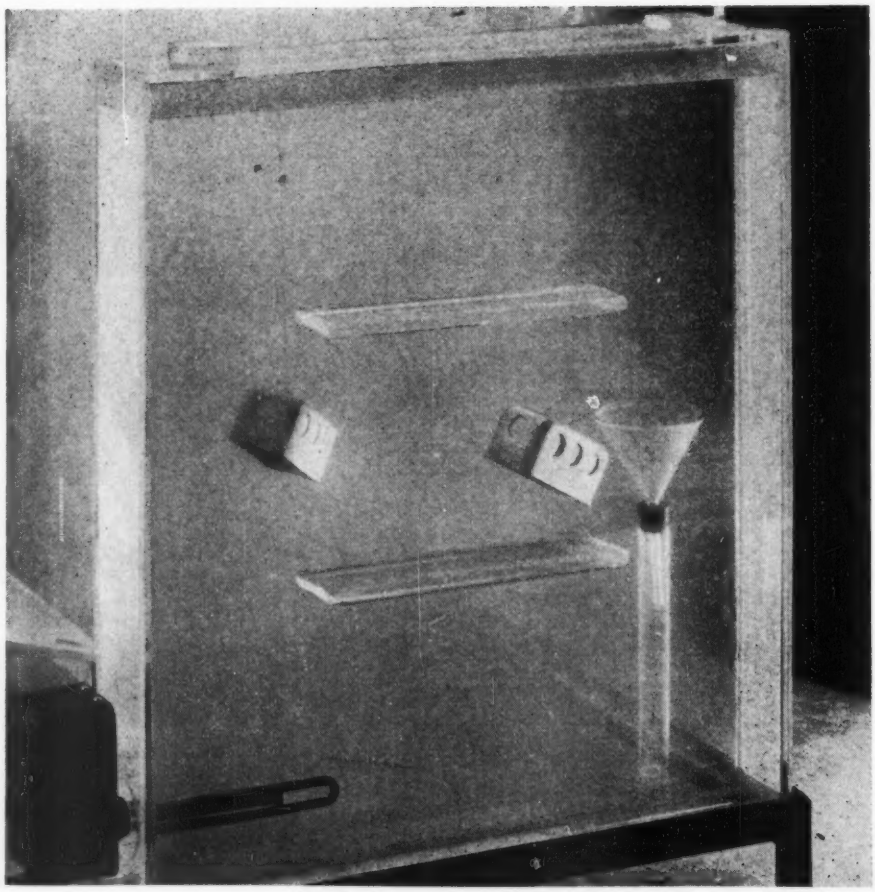


SEE *the* FOG *and be* SURE!

(left) Unretouched photo during test shows fog plainly visible through water jacket "picture window" in Singleton "H-T Sincolite" Corrosion Test Cabinet.

Singleton Cabinet "Visibility" Aids Tests, Improves Accuracy

Exclusive Design and Performance Features of Singleton "H-T Sincolite" Corrosion Test Cabinet Set New Standards for Accelerated Exposure Tests.

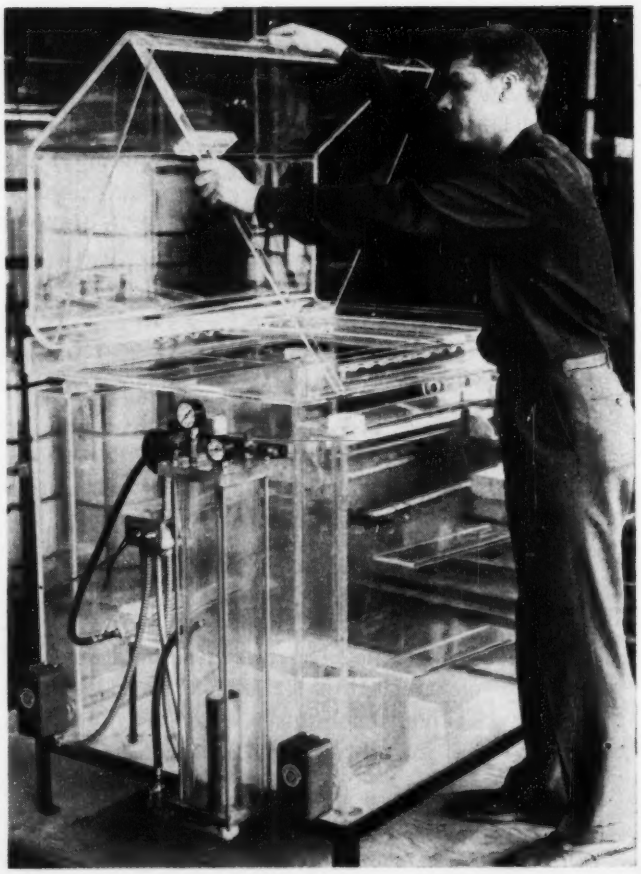
Visual Fog Control — Full length "picture window" visibility. Observe details of procedure without interrupting test or handling specimens. "See" tests in process for more comprehensive data.

Water Jacket Heaters — Full length of cabinet, front and back, for uniform temperature throughout. Users report "results within 10% of absolute duplication". No "hot bottom".

Lasts Years Longer — Fusion-Welded "H-T Sincolite", permanent; can't corrode or become contaminated. No deterioration.

Critical importance of accelerated corrosion tests today require the extraordinary accuracy and superior characteristics of the Singleton Cabinet — only one of its kind made of clear, transparent "H-T Sincolite". Nonporous, inert to test solutions, it prevents secondary galvanic acceleration of corrosion. Complete absence of deterioration and maintenance extends service life years longer. No parts of contaminating materials susceptible to corrosion are exposed to test solutions or vapors. All gauges and metal parts are on the outside. Controls at left end. Built to meet all existing A. S. T. M. and U. S. Gov't Specifications for this type of equipment.

Get complete details. Send for Bulletin T Cab 103



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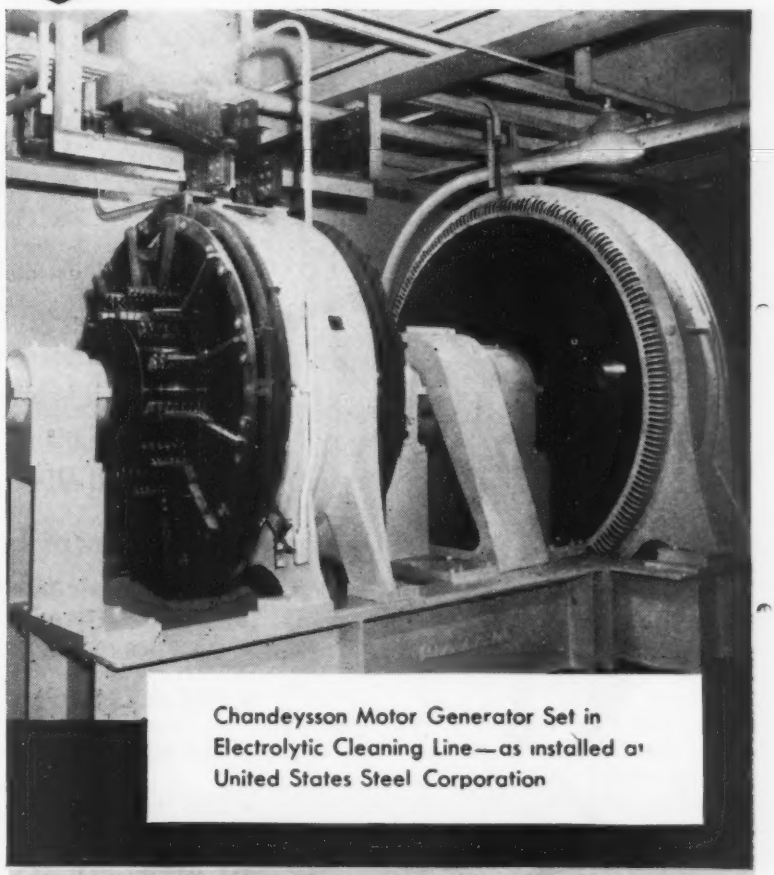
The most modern manufacturing methods are used every step of the way. Unified responsibility for manufacture of every component . . from selected raw materials to finished product is in the hands of skilled men with decades of experience in building low-voltage generators Our aim in engineering is to *prevent* design defects . . . rather than to correct for them This is why more and more "Industry Leaders Choose Chandeysson!"



Chandeysson Motor Generator Set in Electrolytic Cleaning Line—as installed at United States Steel Corporation

MAKE US PROVE *to you that a Chandeysson Motor Generator is your most economical and dependable source of low-voltage dc current Mail this coupon today.*

CHANDEYSSON ELECTRIC COMPANY
4076 Bingham Avenue • St. Louis 16, Missouri

Please send new descriptive booklet D-103

Name. . . . . *Title*. . . . .

Company. . . . . .

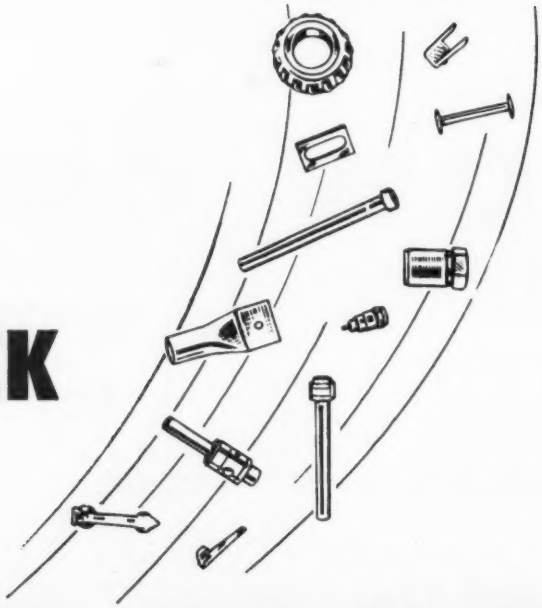
Address. . . . . .

City. . . . . *Zone*. . . . *State*. . . . . .

CHANDEYSSON ELECTRIC COMPANY • 4076 Bingham Avenue, St. Louis 16, Mo.

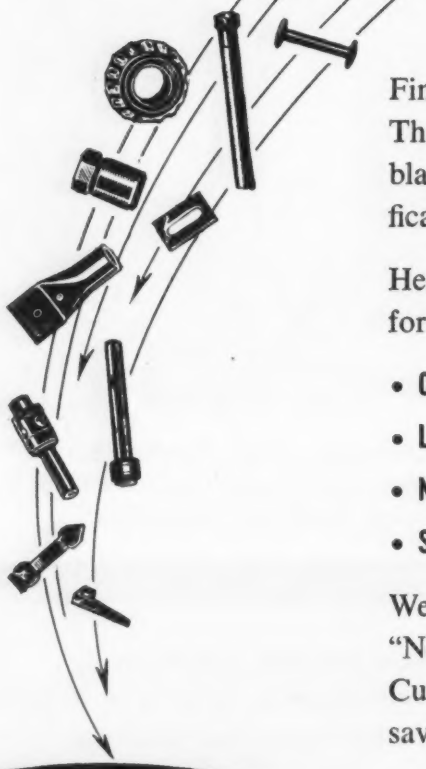
84

keep your production in the **BLACK** *with*



BLACK MAGIC

as illustrated by the rehabilitation of small tools*



Final inspection is the measure of successful production. That's why it is important to use BLACK MAGIC as the black oxide finish. It meets or surpasses government specifications and all other black oxide specifications.

Here are a few of the advantages of using BLACK MAGIC for tool maintenance.

- **Corrosion reduction**
- **Less chip adherence**
- **New tool appearance**
- **Sharper grinding**
- **Reflection reduction**
- **Improves cutting qualities**
- **Longer service life**
- **Reduces grinding time**

We would like to send you a reprint of an article entitled "New Life for Small Tools — Rehabilitation Treatment Cuts Resharpening 50%". It tells how manufacturers are saving thousands of dollars on tool maintenance.

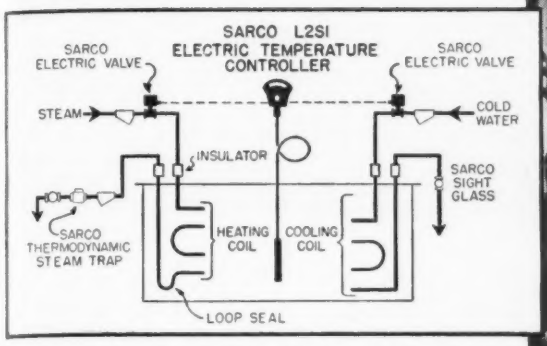
* BLACK MAGIC PROCESS U. S. PATENT #2,355,007

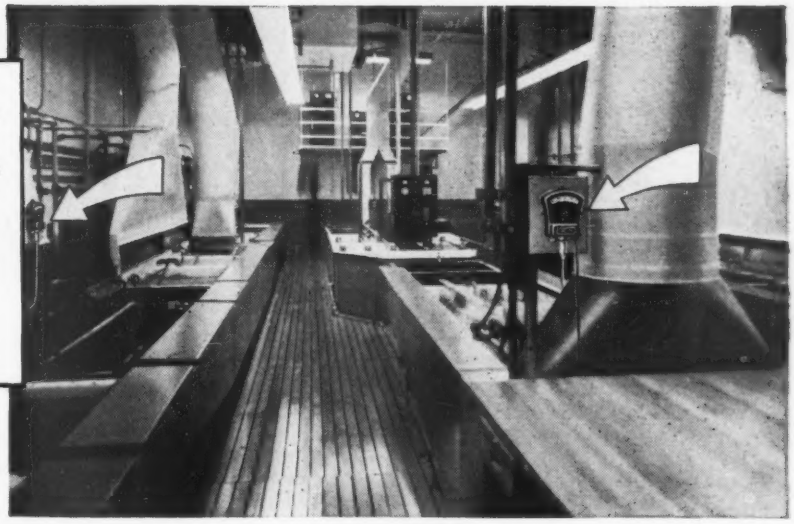
Mitchell-Bradford

THE MITCHELL-BRADFORD CHEMICAL COMPANY

Wampus Lane, Milford, Connecticut

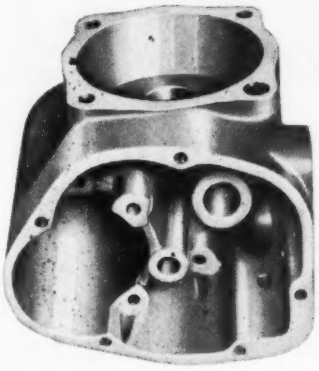
QUALITY PRODUCTS OF CHEMICAL RESEARCH





Scientific plating department of Woodward Governor Co., Rockford, Ill., meets exacting government specifications. All plating and cleaning process tanks are equipped with Sarco Electric Indicating Temperature Controllers.

Tough precision plating problem solved by low-cost Temperature Control



0.0002" tolerance held by Woodward Governor in plating irregular and deeply recessed surfaces

PROBLEM—Look at the above case for an aircraft propeller governor. Its irregular shape and deep recesses present a tough plating problem.

Furthermore, Uncle Sam specified a top quality plate with a thickness tolerance of 0.0003 to 0.0005 inch... to assure mating of parts.

SOLUTION—Key to the solution of this precision plating problem is control of all the variables...and by far the most important is *bath temperature*. When it fluctuates, so does the plate quality... current density is affected...and, therefore, throwing power varies, causing uneven plate thickness.

That is why *all* Woodward Governor plating tanks are equipped with Sarco Electric Indicating Temperature Controllers, which automatically hold the plating solutions to $\pm \frac{1}{2}$ °F.

RESULTS—A top-quality deposit. Throwing power that assures uniform plating thickness on all surfaces... plane, irregular and recessed. Tolerance of 0.0002 inch... actually closer than government specifications. Minimum rejects.

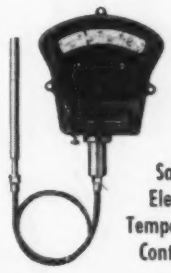
Mr. Delbert L. Zeigler, plant manager of Woodward Governor, writes: "Sarco Electric Temperature Controls are doing an excellent job in every way."

Write for Handbook No. 6 or consult your plating supplies jobber. Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

2130-B

SARCO

improves product quality and output



Sarco Electric Temperature Controller

ADVANTAGES FOR ALL TYPES OF PLATING

LOW COST—about $100

EASY ADJUSTMENT—turn one knob to change temperature setting

ELIMINATES DIFFICULTIES often caused by unreliable manual temperature control:

- Changes in current density
- Variations in plate thickness
- Variations in quality
- Dull finishes
- Breakdown of plating solutions
- Crystallization of salts
- Rejects

Another Richardson Allen Engineering "First"

Demonstrating the same unsurpassed initiative, ingenuity and craftsmanship which, over the years, have set the pace of progress for the entire industry. Richardson-Allen engineers —working in close cooperation with Westinghouse engineers— have developed and perfected the ultimate in power rectification.

SILICON

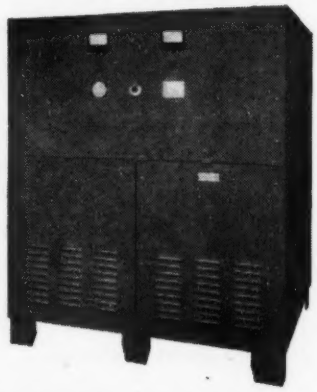
DEPENDABLE POWER RECTIFIERS

HERMETICALLY SEALED JUNCTIONS — HIGH TEMPERATURE OPERATIONS

VERSATILITY—Richardson-Allen silicon rectifiers are now available for the plating and industrial fields in ratings up to 500 kws.

EFFICIENCY—Richardson-Allen silicon rectifier units are now supplying major industries with an unprecedented amount of direct current—with no loss in efficiency, no aging and no apparent limit to the life of the silicon junctions. Single silicon junctions are designed to withstand up to 300 piv.

ECONOMY — Occupying unbelievable small space, the initial cost is often lower than other conversion methods; practically no maintenance is ever needed and when installation savings and power savings are figured the total amount is impressive.



For additional information, write to:

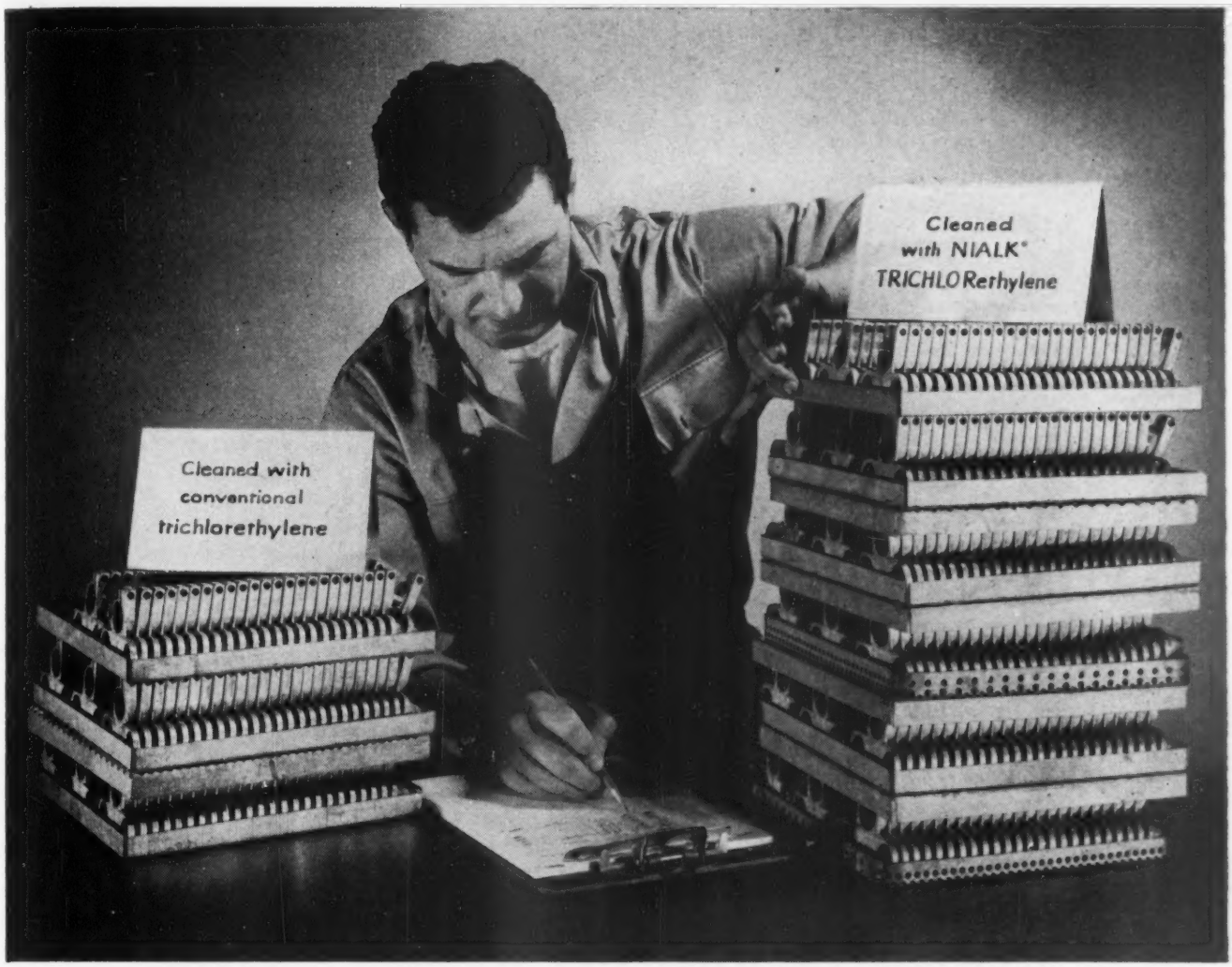
RICHARDSON ALLEN Corporation

DEPENDABLE RECTIFIER SPECIALISTS

a Manufacturing affiliate of

WESLEY BLOCK & CO., INC., 116-15 Fifteenth Ave., College Point, L. I., N. Y.

IN CANADA: Richardson-Allen of Canada, Ltd., 1236 Birchmount Rd., Scarborough, Ontario



Operator using NIALK *TRICHLORethylene cleans more parts, because* NIALK *has* **psp** *which prevents acid contamination, reduces number of cleanouts.*

Why you get more effective degreasing when you use Nialk® TRICHLORethylene with psp

There's a difference—a big, cost-cutting difference—between NIALK TRICHLORethylene and conventional vapor-degreasing solvents.

Light, heat, air, acids, and active metals such as aluminum, given time, can break down improperly stabilized trichlorethylene, making it unfit for further degreasing.

Only Nialk TRICHLORethylene has psp

The stabilizer in NIALK TRICHLORethylene has **psp**—permanent STAYING power. It's neutral, non-alkaline. You *never* have to replenish it.

Only NIALK has this *permanent staying power*. Even after repeated distillations, its unique stabilizer prevents acid formation and other causes of breakdown. NIALK works equally well with *all* metals.

psp means cheaper degreasing . . . here's why

You don't have to clean out your degreaser nearly so often with NIALK TRICHLORethylene. You can degrease many more parts between cleanouts.

The NIALK stabilizer actively retards formation of degradation products in your degreaser—cleanouts are easier, faster.

Get proof of Nialk's cheaper, safer degreasing

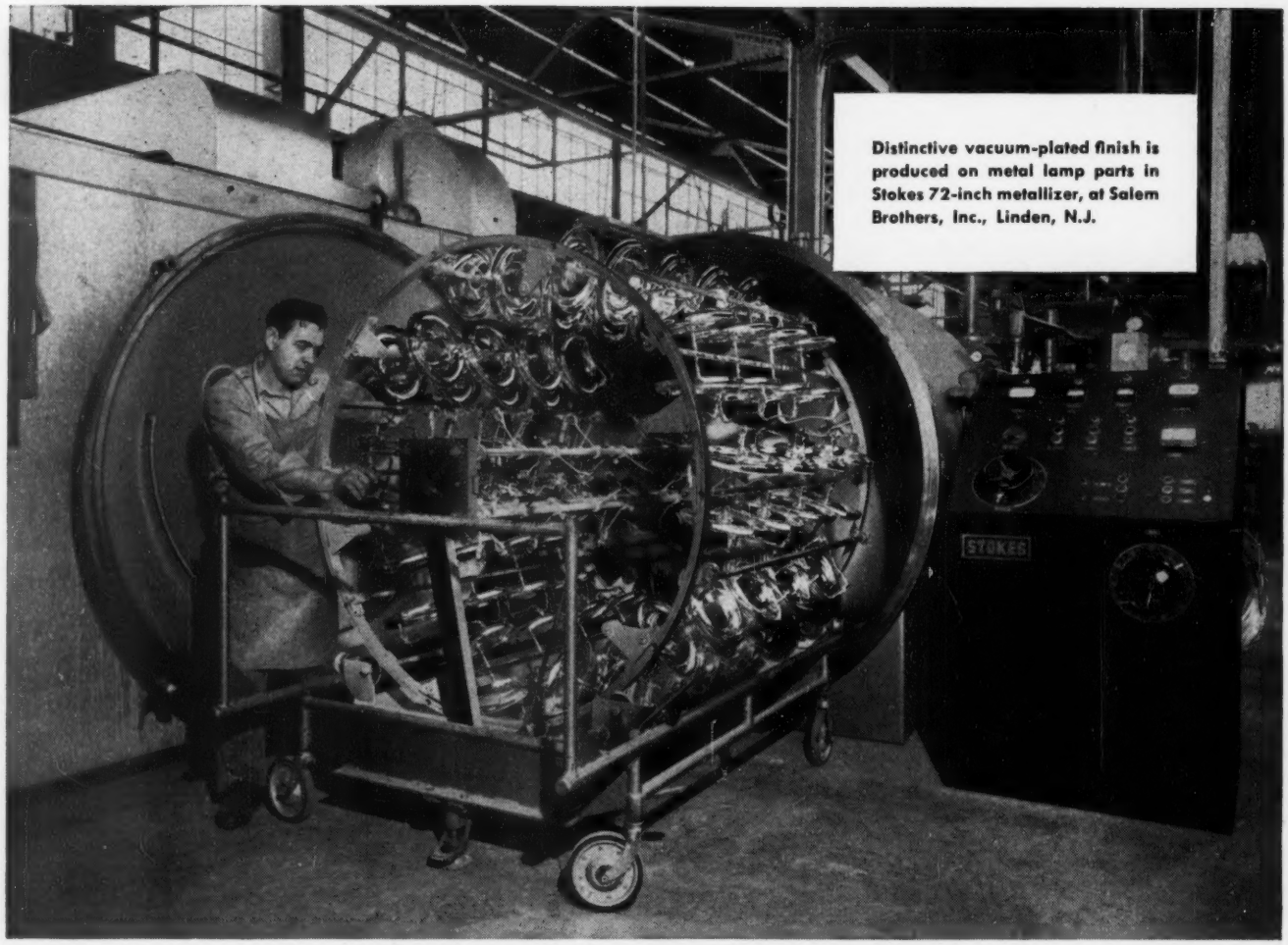
See for yourself how NIALK TRICHLORethylene with **psp** stays stable, keeps cleaning efficiently long after other solvents have lost their punch. Write on your business letterhead for a revealing resumé of comparative metallurgical tests on the five leading brands.

HOOKER CHEMICALS PLASTICS

HOOKER ELECTROCHEMICAL COMPANY
1303 UNION STREET, NIAGARA FALLS, N. Y.

NIAGARA FALLS • TACOMA • MONTAGUE, MICH. • NEW YORK • CHICAGO • LOS ANGELES

Manufacturers of VIRGO® DESCALING SALT, VIRGO ELECTROLYTIC SALT, VIRGO MOLTEN CLEANER



Distinctive vacuum-plated finish is produced on metal lamp parts in Stokes 72-inch metallizer, at Salem Brothers, Inc., Linden, N.J.

Attractive, low-cost vacuum plating ... sparks sales of SALEM lamps

One of the big reasons behind the success of TV and pin-up lamps made by Salem Brothers, Inc., is the attractive and durable finish produced in a Stokes vacuum metallizer.

The metallizing process gives a distinctive gold, brass, copper or chrome finish at costs considerably lower than electroplating ... making it possible to offer smart, modern lighting fixtures at competitive prices. Good finish, according to Salem is especially important in the lamp business, for appearance is a major factor in acceptance by both the price-conscious merchandise buyer and the final consumer.

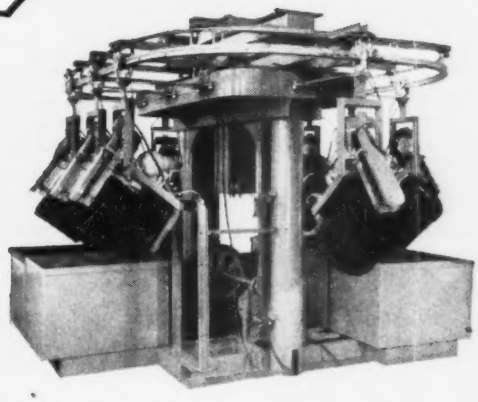
A Stokes 72-inch vacuum metallizer handles finishing at Salem Brothers at efficient, economical production rates ... 1000 complete lamps a day. Interlocked centralized controls make it easy for men to learn the operating routine, and to produce to consistent quality standards with minimum labor. The equipment is compact and self-contained ... takes little floor space.

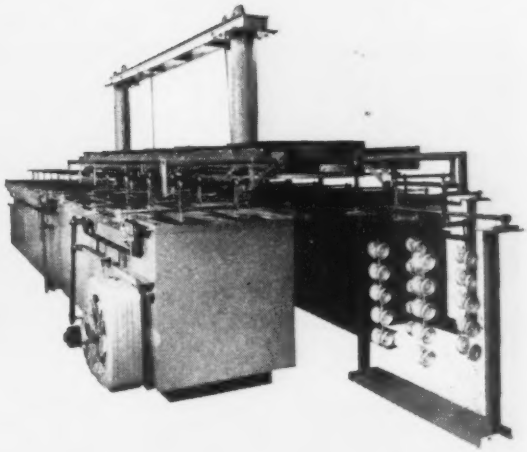
Investigate this modern, low-cost method for finishing metals or plastics. Stokes can give you practical help in over-all planning ... determine plant layout as well as production techniques, rates and costs ... select lacquer and auxiliary equipment ... train your operators.

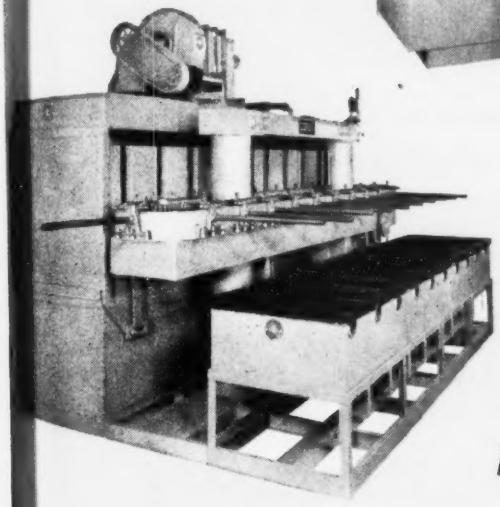
High Vacuum Equipment Division
F. J. STOKES CORPORATION
5533 Tabor Road, Philadelphia 20, Pa.

STOKES

CROWN AUTOMATICS



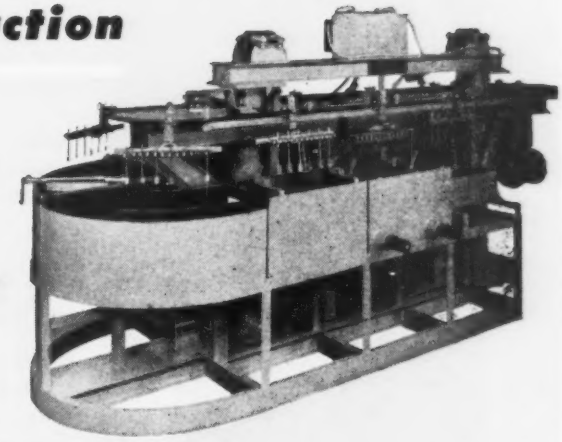


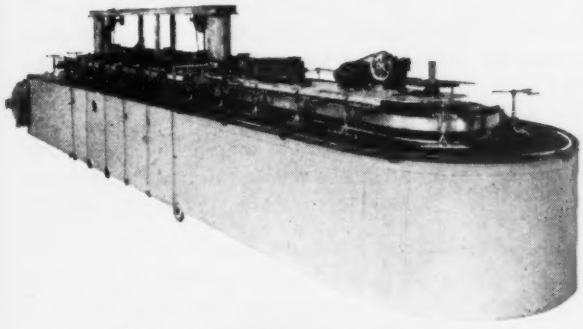


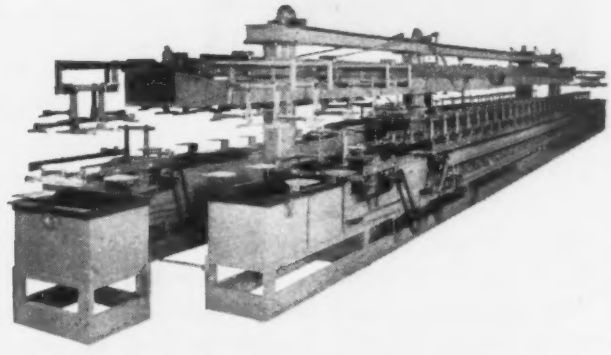
increase production

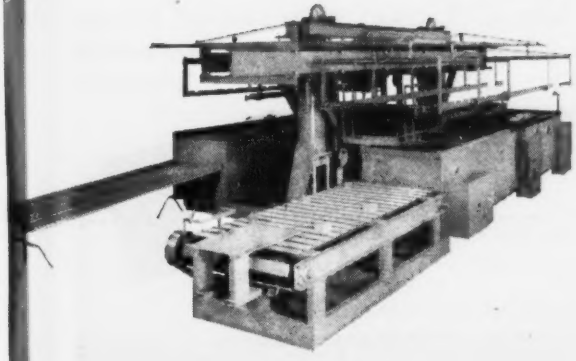
reduce costs

improve quality







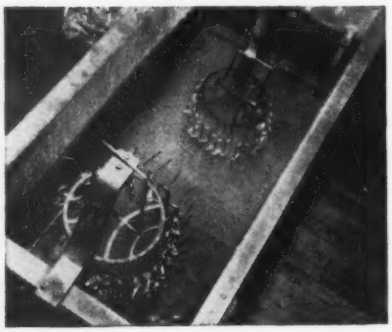


Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry... *there is a model to fit your needs.* Write us details of your job and production requirements.

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

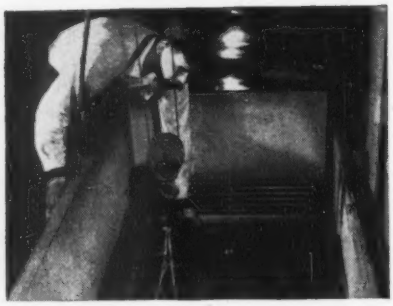
Vapor degreasers – manual or conveyor – show better production with TRICLENE® D



"Brighter cleaning... 50-75% longer between cleanouts"... *American Hardware*

The P. & F. Corbin and Russell & Erwin Divisions of the American Hardware Corp., New Britain, Conn., are well-known for their complete line of builders' hardware which includes locks and door fittings with highly polished surfaces of brass, bronze, copper, steel and zinc.

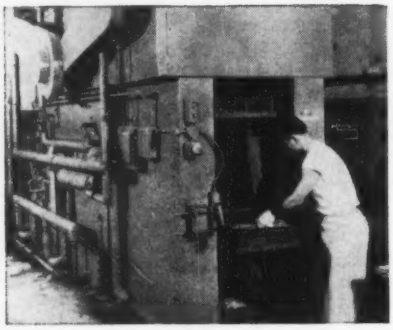
Since these two divisions began using "Triclene" D trichlorethylene exclusively in six conveyorized and three manual degreasers, they report: "Brighter cleaning . . . no necessity to wipe parts before lacquering." They also noted a steadier pH and that operations went 50 to 75% longer between cleanouts and that the coils were easier to clean.



"Far fewer rejects from etching and staining on aluminum"... *Hecker Manufacturing Co.*

One of the big problems this San Francisco firm had to contend with was etching and staining on the highly polished surfaces of their aluminum shower and tub enclosures when the solvent formerly used developed a high acid content. This too frequent occurrence resulted in excessive loss of production from rejects and downtime.

"Since changing to 'Triclene' D," reports Mr. Cary, Plant Superintendent, "we've noticed a big reduction in the number of rejects, and solvent control is no problem at all. This adds up to real savings in maintenance and production costs."



"We have less downtime and consistently high production"... *Standard-Thomson Co.*

When you make accessories for the aircraft, automotive and window-hardware industries, as does Standard-Thomson in Dayton, Ohio, your production lines must match theirs in speed and efficiency. Substandard work and downtime can be very costly indeed. And every operation *eliminated* speeds up production.

Here's what they report: "We haven't any concern about solvent condition since we started using 'Triclene' D. We've noticed a big reduction in the number of rejects due to etching, too. Moreover, we've eliminated bright dipping of brass parts and the time between degreaser cleanouts has been increased from two to six weeks."

Effects of heat, light, air, acids and aluminum chloride are resisted by "Triclene" D with its locked-in stabilizers. That's why it is so widely used for quick, efficient degreasing of all types of metals in so many industries.

Get all the facts on "Triclene" D. Send for this 42-page fact-packed illustrated book which gives you information on all phases and types of vapor degreasing operations. For your free copy, send coupon below.

TRICLENE® D
TRICHLOROETHYLENE

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

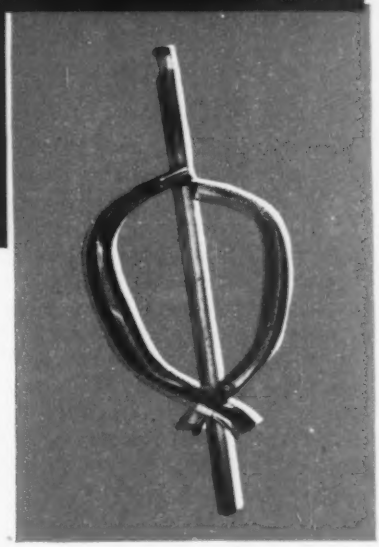
E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department MF-3
Wilmington 98, Delaware

☐ Please send me a copy of your new vapor degreasing booklet.
☐ Please have your representative phone for an appointment.

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

WAGNER ISO-BRITE COPPER . . .

"The efficiency of your new Iso-Brite Copper bath will enable us to put a $7500 'semi' to work on other jobs. We get a deposit of .0005" in a 15 minute cycle and could easily get .0006" to .0008" if required. Iso-Brite needs less maintenance than any bath within our experience." (Robert Hilfinger, Pres. Hilfinger Corp. to Jos. R. Wagner.)



Die cast automotive grill part ready for nickel and chrome.

doubles

SEMI-AUTOMATIC PLATING!

CONVERSION TO ISO-BRITE ELIMINATES ONE MACHINE . . .

The record at Hilfinger Corp., Toledo, Ohio, tells a simple story. This big, 115,000 sq. ft. die casting plant with a 200-man plating department originally required two semi-automatic plating machines for plating copper before nickel and chrome on large automotive die castings. New Wagner Iso-Brite Copper bath was installed eight months ago in one tank, replacing a leading proprietary copper bath, both machines being operated by a single generator. Excessive burning of the competitive plate resulted. The single machine charged with Wagner Iso-Brite Copper now turns out Hilfinger's entire production requirement to the customer's specification, permitting the surplus semi-automatic to be devoted to other production.

If reducing finishing costs is of interest to you, consider these reasons why this new Wagner-processed chemical is making records everywhere:

Wagner Iso-Brite Copper offers

1. Ease of control
2. High anode efficiency—copper cyanide additions virtually eliminated
3. Much heavier plate
4. Fine grained, dense, ductile, fully bright
5. Freedom from roughness
6. Wide operating range—temperature 135-165°; up to 60 amperes per square foot
7. High tolerance of organic contamination

Wire, phone or write for Bulletin 70.2 for full technical information on Iso-Brite Copper and the Wagner cadmium and zinc brighteners and chromate finishes. Please pass this advertisement along to your purchasing agent or plating superintendent. The Wagner man in your area will assist you with any plating problem.

400 MIDLAND AVE., DETROIT 3, MICHIGAN
CHICAGO • CINCINNATI • CLEVELAND • INDIANAPOLIS • NEW YORK • ROCHESTER • GRAND RAPIDS

Wagner BROTHERS INC.

Facts to consider when you're buying

Chromate Conversion Coatings

for Corrosion Protection, Paint Base, Decorative Finishing

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002″ max.) gel-like, complex chromate film of a nonporous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

If your company is manufacturing or buying parts or complete assemblies made from or plated with any of the more common non-ferrous metals—zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze—you've probably already run up against the question of finishing these surfaces with a chromate conversion coating. These coatings are used to protect against corrosion, or to provide a base for paint or to provide a decorative finish for sales appeal or shelf life. Since chromate conversion coatings represent a relatively new means of obtaining these finishes, this digest of facts to consider may be of value to you.

1. THE COATINGS THEMSELVES. There are many brands on the market. All are similar in many ways. Each, of course, offers its own specific advantages and these may relate to operating techniques, performance under actual use conditions, cost, availability, etc. Naturally, you'll want to choose a coating that is widely known and accepted under both military and civilian specifications.

2. THE COMPANY BEHIND THE PRODUCT. Is it a reliable, established organization? Does it offer experienced technical service, both from the field-engineering organization as well as the home office and laboratories? The man who sells and services your installation should be thoroughly familiar with not only chromate conversion coatings and their applications, but also with the characteristics and performance of related finishing operations such as precleaning, electroplating, painting, etc. This is most important since all steps of the finishing cycle must be functioning properly for the satisfactory performance of the ultimate finish produced.

3. AVAILABILITY OF THE PRODUCT. Ideally, of course, the material should be readily available to you from nearby warehouses to avoid time loss in long distance shipping and to provide emergency service, should the need arise.

4. COST. Naturally, the initial price of the material is important to you. However, just as you consider ultimate cost when you are buying mechanical equipment, ultimate cost must be considered for these finishing chemicals. So, it will pay you to investigate consumption costs, labor costs and the other factors which go into the determination of ultimate cost. Further, cost alone gives no indication of product performance, so careful attention must be given to the purpose the finish must serve and the value that finish will add to your product.

5. FACILITIES FOR RESEARCH AND DEVELOPMENT. Perhaps the existing types of chromate conversion coatings do not include a compound that will accomplish exactly what you wish. Then, it is important to deal with a supplier who has adequate research and development facilities available to work with you to produce a material to meet your needs. Naturally, such a project is seldom completed overnight. But, with complete cooperation and confidence from both you and your supplier, chances are a satisfactory program can be completed.

These are the concepts of sales and service on which we, Allied Research Products, Incorporated, have developed and marketed the line of Iridite chromate conversion coatings . . . superior product performance, complete sales and technical service, easy product availability, economical cost, extensive research and development facilities. No doubt you are familiar with our line and have seen this trademark—

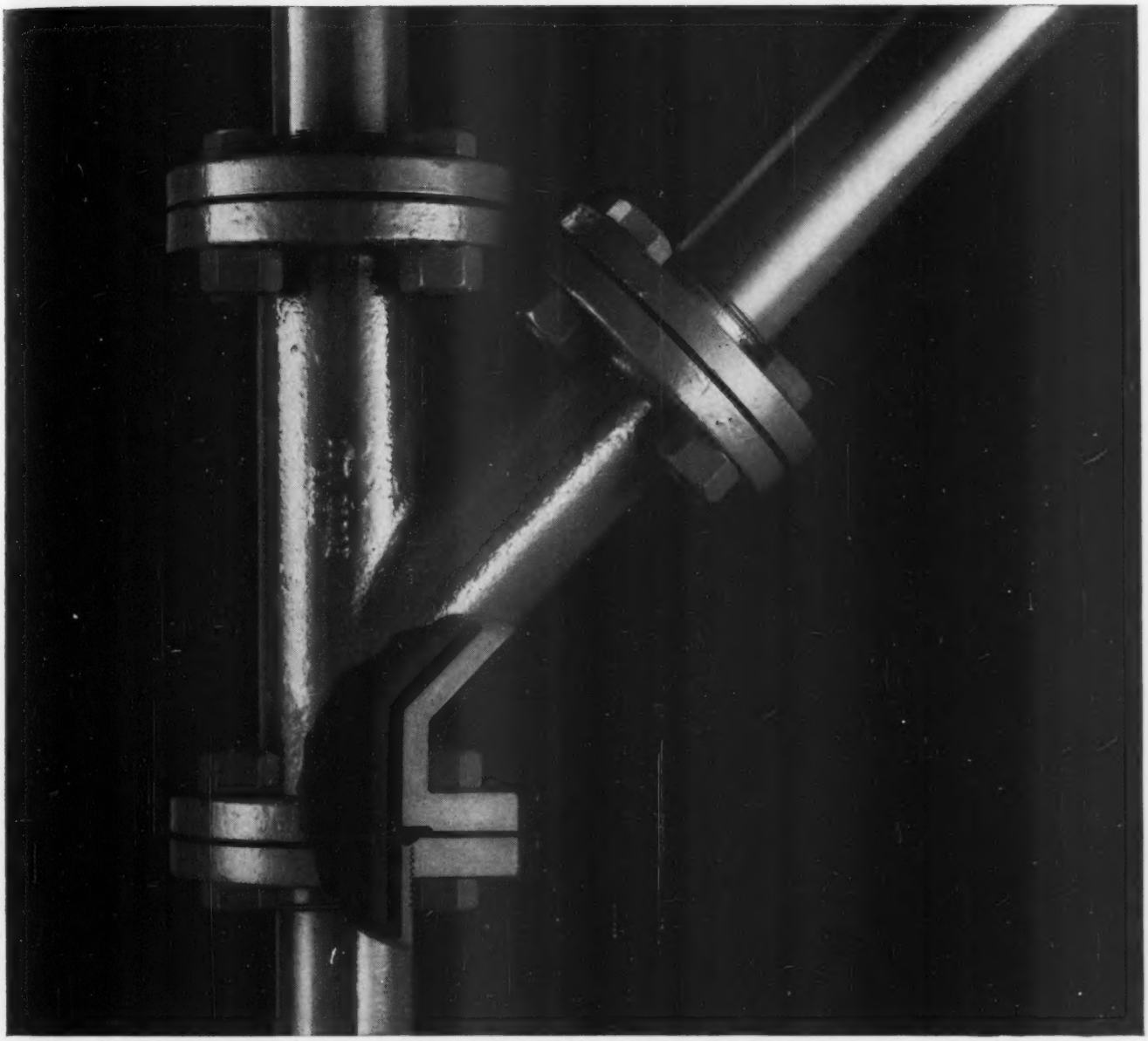
IRIDITE®

—in our advertising, technical literature or on shipping containers in your plant. Remember this trademark when you're buying or investigating chromate conversion coatings for your company. It's your assurance of quality, economical products from a reliable and established company, skilled sales and technical service from both our home office and a national network of representatives, immediate availability from warehouses in strategic industrial areas and our willingness to work with you to develop new finishes to meet your needs, should the present line fall short.

For complete information on Iridite chromate conversion coatings, write today for your free copy of our technical data file. Or, for immediate advice, call in your Allied Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite chromate conversion coatings for corrosion resistance, paint systems, final finishing of non-ferrous metals; ARP Plating Brightener & Chemicals. West Coast Licensee—L. H. Butcher Co.



Cutaway view shows how corrosive liquids are prevented from touching metal in saran lined pipe and fitting.

You can see why saran lined pipe is so corrosion resistant!

It's steel pipe lined with durable saran . . . acids, alkalies can't harm it

Corrosive liquids won't harm this pipe, its fittings or its valves. A thick, tough saran lining completely protects it from commonly used acids, alkalies, other corrosive liquids.

It's strong, too. Saran lined pipe will withstand working pressures up to 300 psi. Saran lined valves and fittings are available for working pressures of 150 and 300 psi. You can use the same supports you would use with ordinary steel pipe.

Ease of fabrication will keep your installation costs down. Cutting and threading can be readily accomplished in the field with conventional hand tools or power equipment.

For tomorrow's protection, investigate saran lined pipe today. THE DOW CHEMICAL COMPANY, Midland, Michigan.

SARAN LINED PIPE COMPANY
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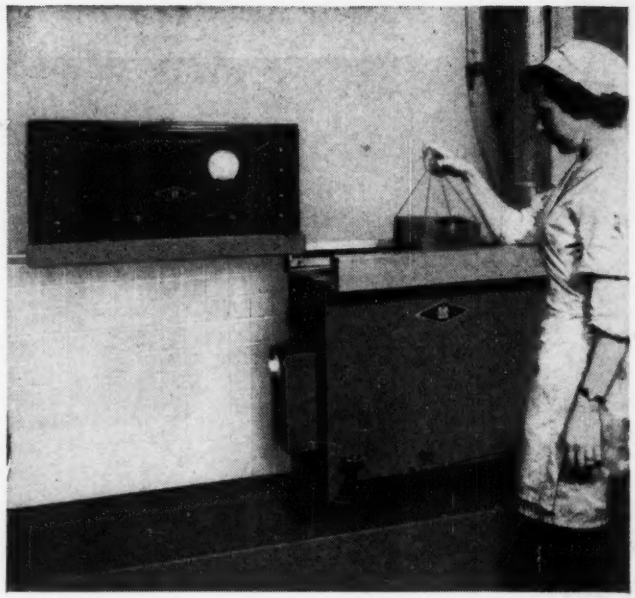

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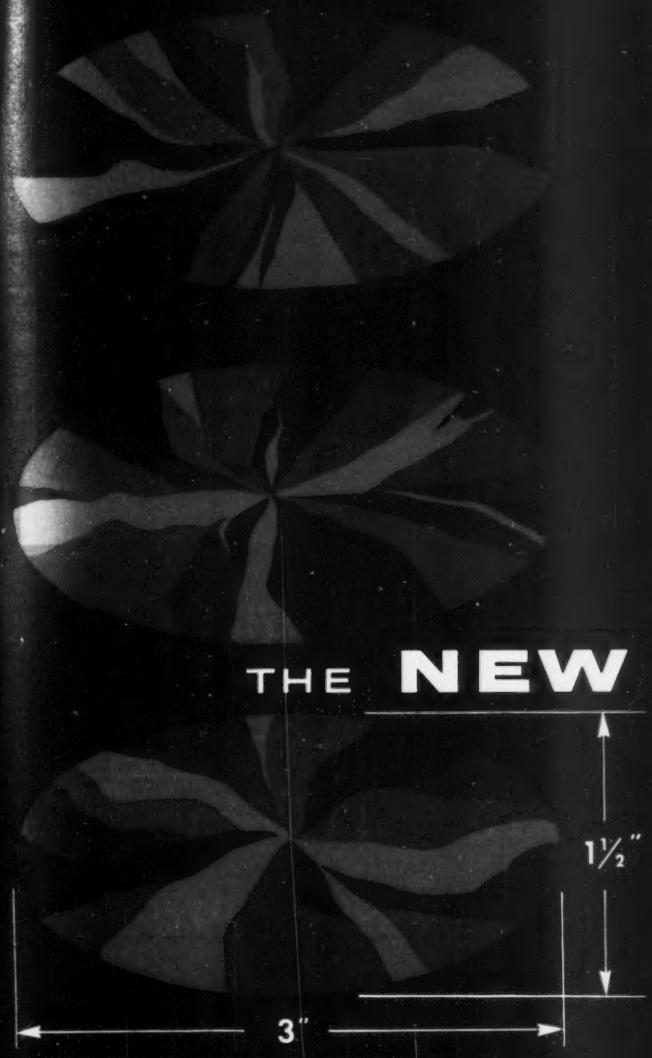

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   this means
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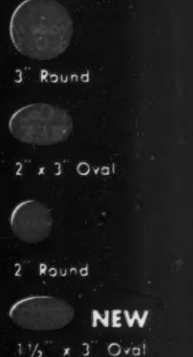

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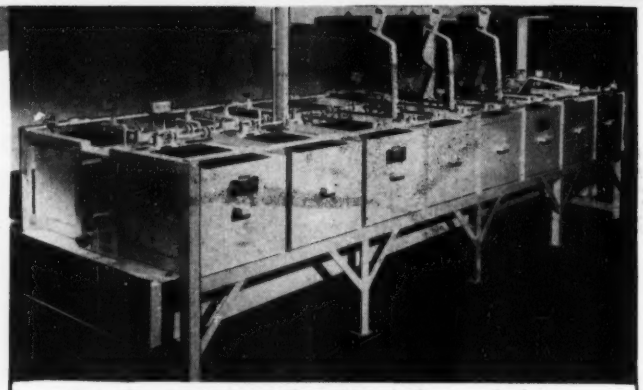

Whenever your work demands a high degree of quality and uniformity — that's when you should get all the facts on Daniels Custom Packaged Platers. Each of these completely self-contained plating plants is designed to meet your specific production needs. Daniels Custom Packed Platers have found wide acceptance in the electronics and jewelry industries, where precise quality control is a major objective. Also, you'll make these three important savings: Compactness (small floor area), low installed cost, speed of operation without sacrificing uniformity.

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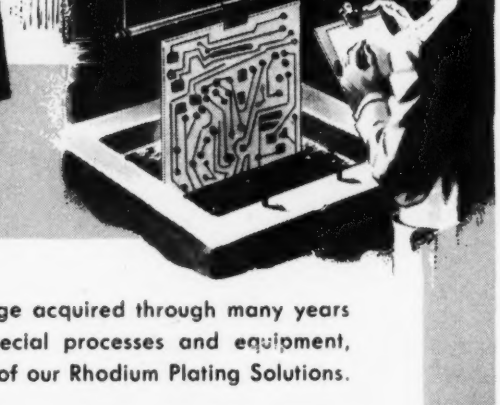

Consult our staff, without obligation, about your specific plating problems.

SINCE 1901

Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.

Recommended for contact surfaces of switches, waveguide parts and other electrical applications; can be applied in extremely heavy deposits, where required, up to 100 miligrams per square inch.

Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.

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Simple bronze plating process gives gold-like finish

- ***M&T copper-tin process deposits extraordinary, golden-glow decorative plate . . .***
- ***Also cuts need for nickel as undercoat***

BRONZE plating has proved itself a practical finish in large and small installations. The copper-tin process developed by Metal & Thermit eliminates usual difficulties and disadvantages in alloy plating. It is as easy to operate and control as normal processes depositing a single metal.

Equally important, this bronze can be deposited with brilliant 24K gold color by using a trouble-free brightener. Protected with a clear organic coating, it provides a high quality decorative finish with unusual appeal and long life. Overall cost of this bronze rivals that of copper and is less than that of a brass plate.

M&T Bronze gets the trophies. Golden-glow finish for die cast trophy cups wins over copper-nickel-gold formerly used by leading producer.

VALUABLE UNDERCOAT

As an undercoat, M&T Bronze has these qualifications: Good corrosion resistance; hardness better than copper and virtually equal to nickel; more ductility than nickel.

Undercoat-bronze can be plated semi-bright or matte. Both buff more readily than copper and with less chance of cut-through on edges.

OPERATIONAL ADVANTAGES

M&T Bronze offers better than twice the speed of fast copper plating solutions. There are numerous installations working at normal current densities of 60-75 amps per sq. ft. Densities of 100 amperes deposit over one-tenth mil a minute smoothly.

Golden-glow bronze delivers uniform color on intricate decorative work. So outstanding is its throwing power, it is being used to replace copper on complex automobile parts. It uses single anode circuits, and copper anodes which corrode uniformly. The tin is supplied by potassium stannate additions, assuring simple, economical control of the process.

For an unusual finish, both in appearance and protective function, the golden-glow M&T Bronze Process offers interesting possibilities to metal finishers and designers. Send for data.

What's news in tin anodes

Two types of M&T Anodes are available for tin plating processes.

M&T "High Speed" Tin Anodes, developed for stannate baths, have wider effective current density range than ordinary anodes. Taking higher currents without becoming passive, they speed up plating. They form *darker*, more recognizable working film. They pass more current for a given voltage.

The other type, M&T Pure Tin Anodes, are designed for work both in acid baths and alkaline baths. They're cast from highest purity tin. Send for data on both types.

New economy in chromate finishing

Several newly developed Unichrome Dip Compounds work at extreme dilutions. They offer chromate solutions with still lower make-up and operating costs than previously delivered by economical Unichrome Dips. These new Dips make it practical to preserve shelf life and appearance of galvanized, zinc plated or die cast items, even those having low unit price or narrow margin of profit.

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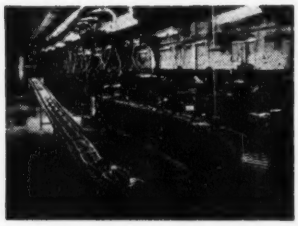
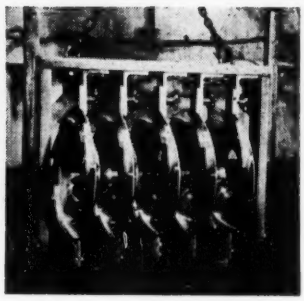


Includes newest techniques for preparing and cleaning metal surfaces.



Shows how to save on cleaning, plating and finishing costs.

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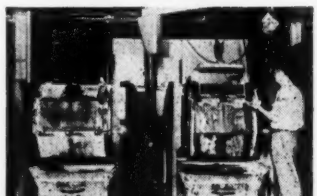
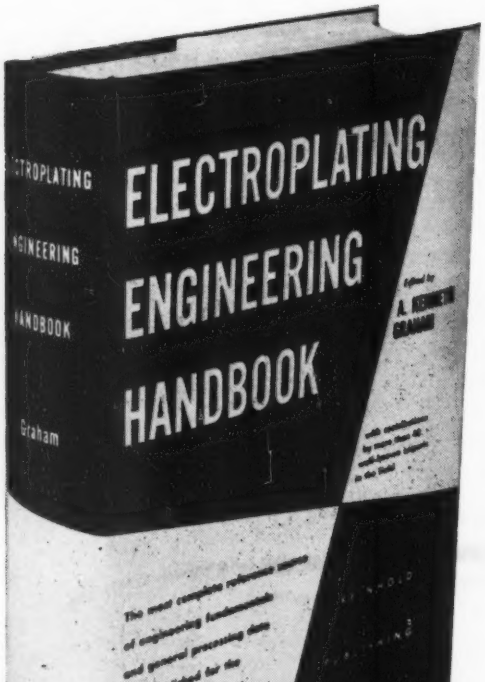
President of Graham, Crowley & Associates, Inc. in collaboration with over 40 widely-known authorities in the electroplating field



Describes barrel finishing methods for small, large and precision parts.



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The complete, up-to-the-minute data book long needed by everyone in the electroplating and metal finishing field! Now, with this big, 660-page book at hand, you can quickly find the answer to practically every imaginable engineering or processing problem!

Jam packed with tables, charts, plans and illustrations, this new Handbook brings you all the most recent information available on processing techniques and the engineering factors involved in constructing and installing plating equipment. Full chapters cover the design of parts to be plated, metal surface preparation, standards and specifications, bath compositions, processing sequences, waste treatment, manual and automatic plating machinery, filtration, rinsing and drying, and all other engineering and operating considerations.

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- Design for plating
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- Design for phosphate treatment processes
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- Plating barrels — design and engineering applications
- Design and engineering features of rectifiers
- Engineering of PR cyanide copper plating installations
- Metallurgy for the electroplater
- Disposal of plating wastes
- Plating bath compositions and operating conditions — construction materials, filtration, agitation, heating or cooling, amperage, voltage, type of anodes
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EASY TO CONTROL

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● ***High Chloride* Bright Nickel Processes,*** as pioneered by Udylite give faster, brighter nickel finishes than any other processes. Only Udylite produces high chloride bright nickels.

The Udylite family of nickel processes cover every possible application. The advantages of the Hi-C brighteners are also obtainable in the Watts type formulation. All these new Udylite nickel brighteners are liquids—easy to use.

Hi-C PROCESSES SAVE NICKEL: With their inherent better throwing power, less nickel is used to obtain thickness requirements in recesses. Baths with one third less nickel concentration are used to get the same results. This means decreased drag-out losses. Fewer anodes are needed since Hi-C processes provide the best anode corrosion of any nickel bath. You can operate satisfactorily with fewer anodes in your tanks.

Hi-C PROCESSES GIVE FASTER PLATING: Plating speed is increased 50 to 100% with Hi-C Bright Nickel as compared to Watts type formulations. Higher current densities can be used without burning. Even where agitation is not available, this same improvement prevails. You get faster plating with higher bath temperatures—can be as high as 190°F.

The Hi-C processes have the highest tolerance of any bright nickel baths to zinc, copper, iron, chromium, chromic acid and other common inorganic impurities; no problems with hard water; excellent tolerance to organic impurities. These characteristics of Hi-C processes plus their stability, mean exceptionally long periods between bath purifications and thereby less down time than any other bright nickel baths.

Hi-C PROCESSES SAVE POWER: With the highest conductivity of any bright nickel bath the Hi-C processes require less voltage to do the same job. It means higher current with the same voltage or the same current with lower voltage.

Hi-C PROCESSES PROVIDE:

Exceptional Bright Plate Range • Excellent Leveling • Fast Rate of Brightening • Superior Ductility • Easy Control • Less Hydrogen Embrittlement from Chromium Plating.

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UDYLITE 72 Hi-C Bright Nickel Process

FOR RACK PLATING

This is the work horse of the Udylite Bright Nickel Processes. It is an evolution of the time tested, world famous Udylite Number 31 Bright Nickel Process which has been a standard for over fifteen years. It is an excellent process where the production is made up of a wide variety of work.

The Udylite 72 Hi-C Process provides faster plating speed, a brighter finish, unusually simple control and greater throwing power, than Watts formulations.

Other advantages are leveling, tolerance to metallic and organic impurities and freedom from pitting. It produces no harmful breakdown products.

COMPARISON OF PLA

Plating speeds and average current densities for Udylite Watts type bright nickel process vs Udylite Hi-C Bright Nickel Processes		Udylite Bright Nickel Process for Rack Plating. Watts Type. #72—#724	Udylite Hi-C Bright Nickel Process for Rack Plating. #72 Hi-C—#724 Hi-C	Bright for
	AVERAGE CURRENT DENSITY	40 Amperes per Square Foot	60-80 Amperes per Square Foot	10 S
	PLATING TIME FOR .001 THICKNESS	30 Minutes	15-20 Minutes	1

UDYLITE 724 Hi-C Bright Nickel Process

FOR RACK PLATING

The superior all-purpose Bright Nickel Process. No other process, with or without mechanical agitation, can compare with Udylite 724 Hi-C from any standpoint.

As compared to Watts type bright nickel formulations Udylite 724 Hi-C will permit up to 100% faster plating and you get unusually fast brightening even when thin deposits of nickel are applied. It has been developed also for the best leveling characteristics. Surface imperfections such as polishing lines, extrusion ridges and scratches are leveled out with this process. This means lower polishing costs for a given finish.

Even with the increased brightness and leveling, excellent ductility is maintained. Since 724 Hi-C is tolerant to metallic and organic impurities you will benefit from longer periods between treatments of the solution. This means less down time and lower costs.

You should try Udylite 724 Hi-C Bright Nickel Process. A test will tell you more than words.

UDYLITE 7B4 Hi-C Bright Nickel Process

FOR BARREL PLATING

Here is the bright nickel process for barrels you have been looking for. Process 7B4 Hi-C offers 50% faster plating speed in barrel nickel plating than any other process.

The rate of brightening is so fast that one-third less nickel may be required to achieve the desired brightness and to hide basis metal defects. This also means fifty percent more production due to the acceptable thinner deposits. It allows for easier chromium coverage for racks or in chromium plating barrels. When using 7B4 Hi-C, current interruptions inherent in barrel plating do not cause laminated deposits.

Ductility and adhesion are excellent.

OF PLATING SPEEDS

Udylite Bright Nickel Process for Rack Plating. Watts Type. #66	Udylite Hi-C Bright Nickel Process for Rack Plating. Air Agitated. #66 Hi-C	Udylite Bright Nickel Process for Barrel Plating in 40 x 30 horizontal barrel—60 square feet of platingarea. Watts Type. #7B4	Udylite Hi-C Bright Nickel Process for Barrel Plating in 40x30 horizontal barrel—60 square feet of plating area. #7B4 Hi-C
100 Amperes per Square Foot	150 Amperes per Square Foot	200 Amperes per Cylinder	350 Amperes per Cylinder
12 Minutes	8 Minutes	Plating Time for .0001 Thickness @ 12 Volts 40 Minutes	Plating Time For .0001 Thickness @ 12 Volts 23 Minutes

UDYLITE 66 Hi-C Bright Nickel Process

FOR RACK PLATING

This process was developed by Udylite Research to fill the need for a bright nickel bath which will plate as fast as possible and at the same time retain desirable characteristics of deposit which are frequently sacrificed when other processes are forced beyond their reasonable maximum plating speeds. In order to accomplish this result air agitation is used. This, together with an unusual combination of addition agents, fully covered by Udylite patents, makes possible not only unusually high deposition rates but also exceptional inherent ductility, brightness, and leveling together with minimum hydrogen embrittlement from chromium plating.

Udylite 66 Hi-C has remarkable freedom from pitting without the use of a wetting agent.

If you are now operating at maximum capacity of your present process and must get more production, it will pay you to investigate Udylite process 66 Hi-C.

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UDYLITE 42 J Bright Nickel Process

FOR RACK PLATING

This process was developed by the Udylite Research Corporation for die cast and steel parts where only a thin coating of nickel is required. It has a greater tolerance to zinc than any other bath.

Process 42 J gives brightness faster than other processes which makes it desirable where only thin nickel deposits are specified, and still a brilliant coloring is desired. This permits an acceptable plate with great savings in the amount of nickel used.

The 42 J Bright Nickel Process also does an excellent job in plating in the low current density areas and still maintaining its brightness in these areas.

Udylite 42 J is not furnished in a high chloride formulation.

UDYLITE N.C.S. Nickel Process

FOR RACK PLATING

A semi-bright nickel with extremely ductile plate as is necessary for parts such as automobile bumpers and bumper guards where there is frequent impact. The extreme ductility gives the finest protection to the plated parts as it will stand greater deformation without cracking than bright nickel deposits. It produces a sulfur-free deposit. It has excellent leveling and unequalled stability for processes of this kind.

The Udylite N.C.S. Nickel Process hides coarse polishing lines and requires only a light buffing to bring out an excellent nickel color although it is more often used as a base for an overlay of one of the Udylite Fully Bright Nickel Processes.

Udylite N.C.S. is a special formulation featuring ductility although still maintaining the inherent advantages found in other Udylite Nickel Processes.

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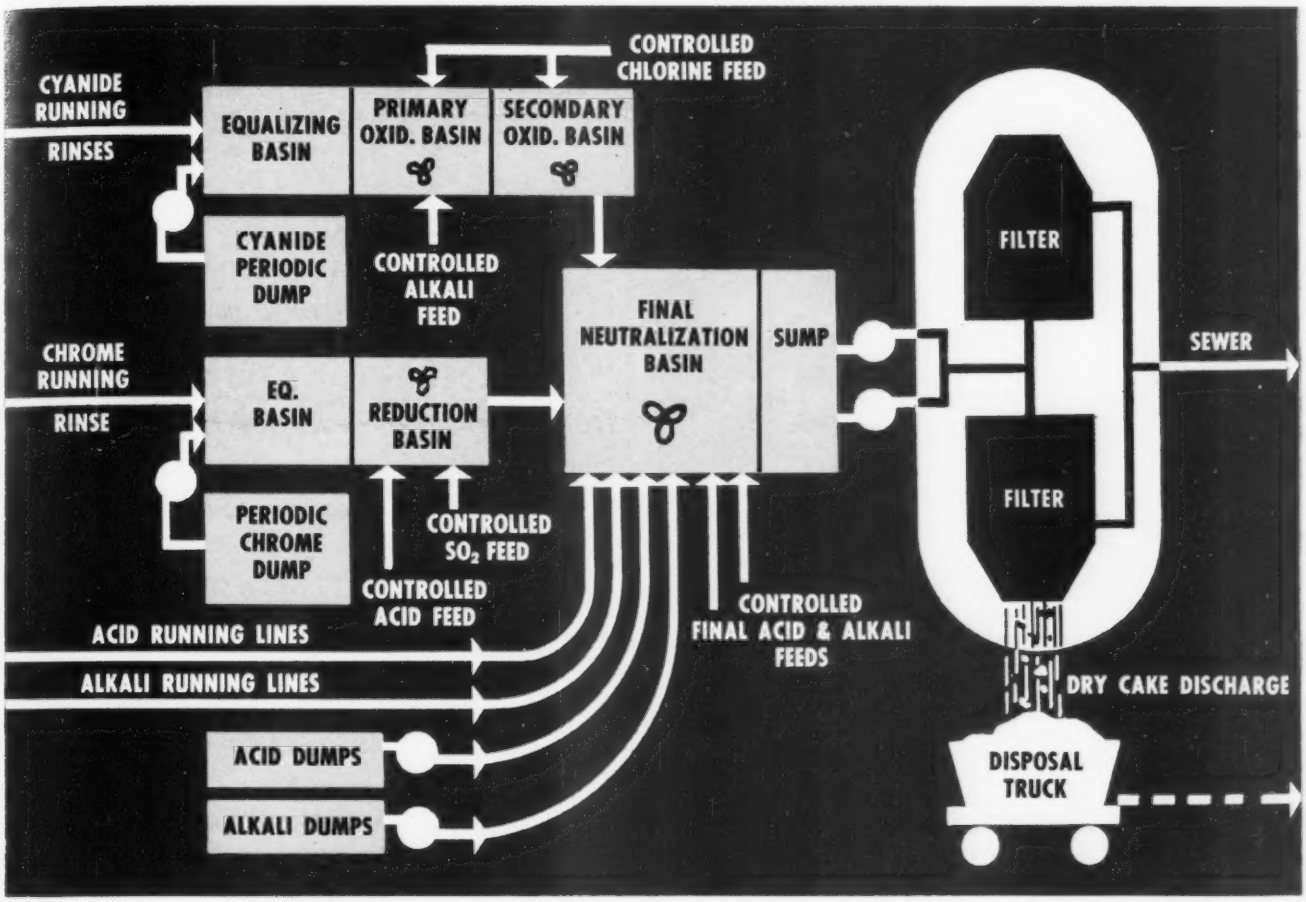

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A large midwest appliance plant has several plating lines and wanted a centralized method for disposal of corrosive wastes. **When the bids were in, they chose this Industrial system** that uses compact modern filters instead of conventional clarifiers.

The plating lines discharge acid, alkali, cyanide and chrome wastes from rinsing operations and periodic dumps. Toxic chemicals are destroyed and then brought, together with other rinses, to a central basin where they neutralize one another, requiring only small amounts of added chemicals to precipitate the dissolved metals and permit their separation by filtration. The filters extract the solids and discharge a neutral non-toxic effluent to the city sewage system.

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- ✓ **Construction . . . no excavation or complex concrete work**
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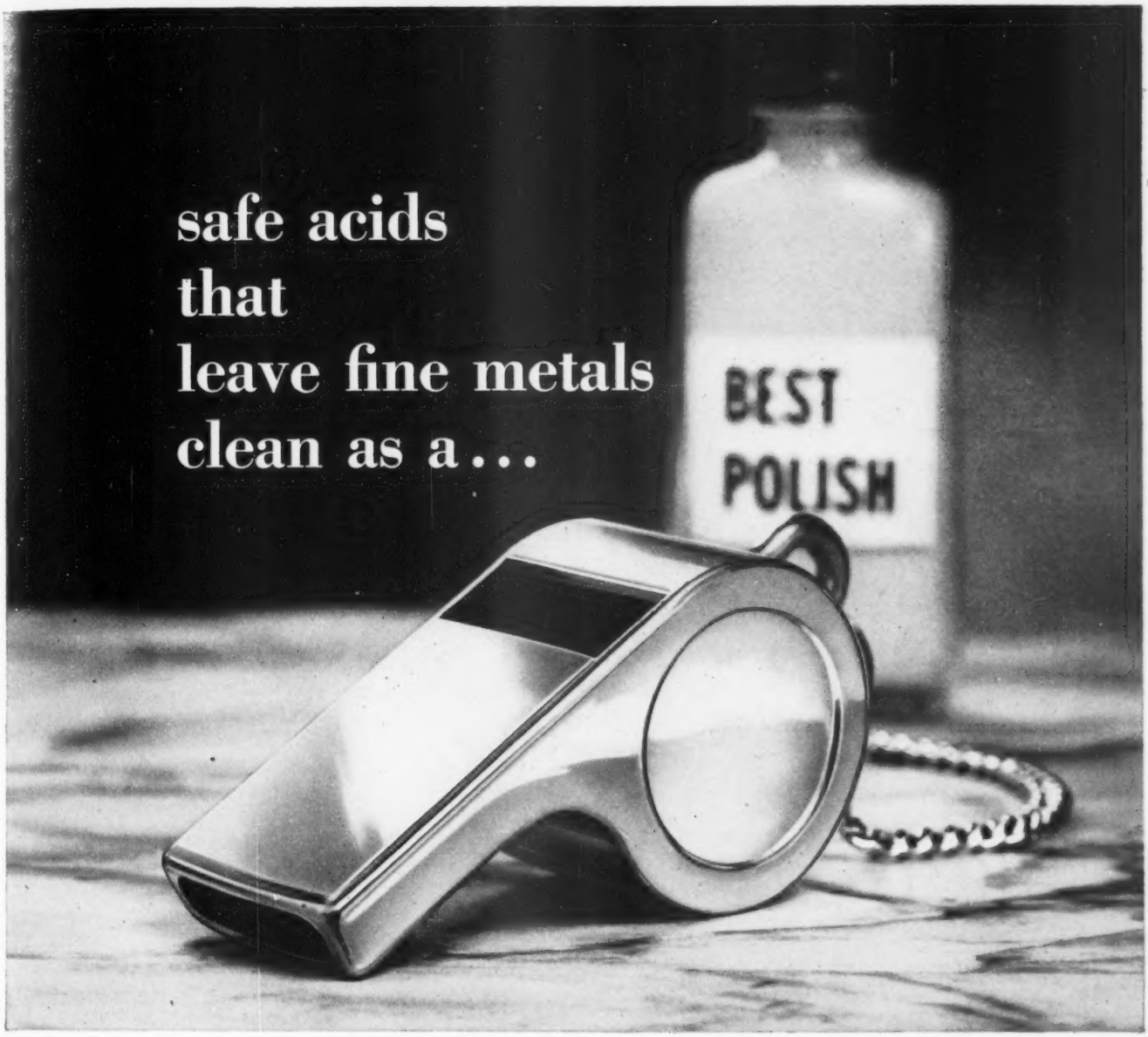

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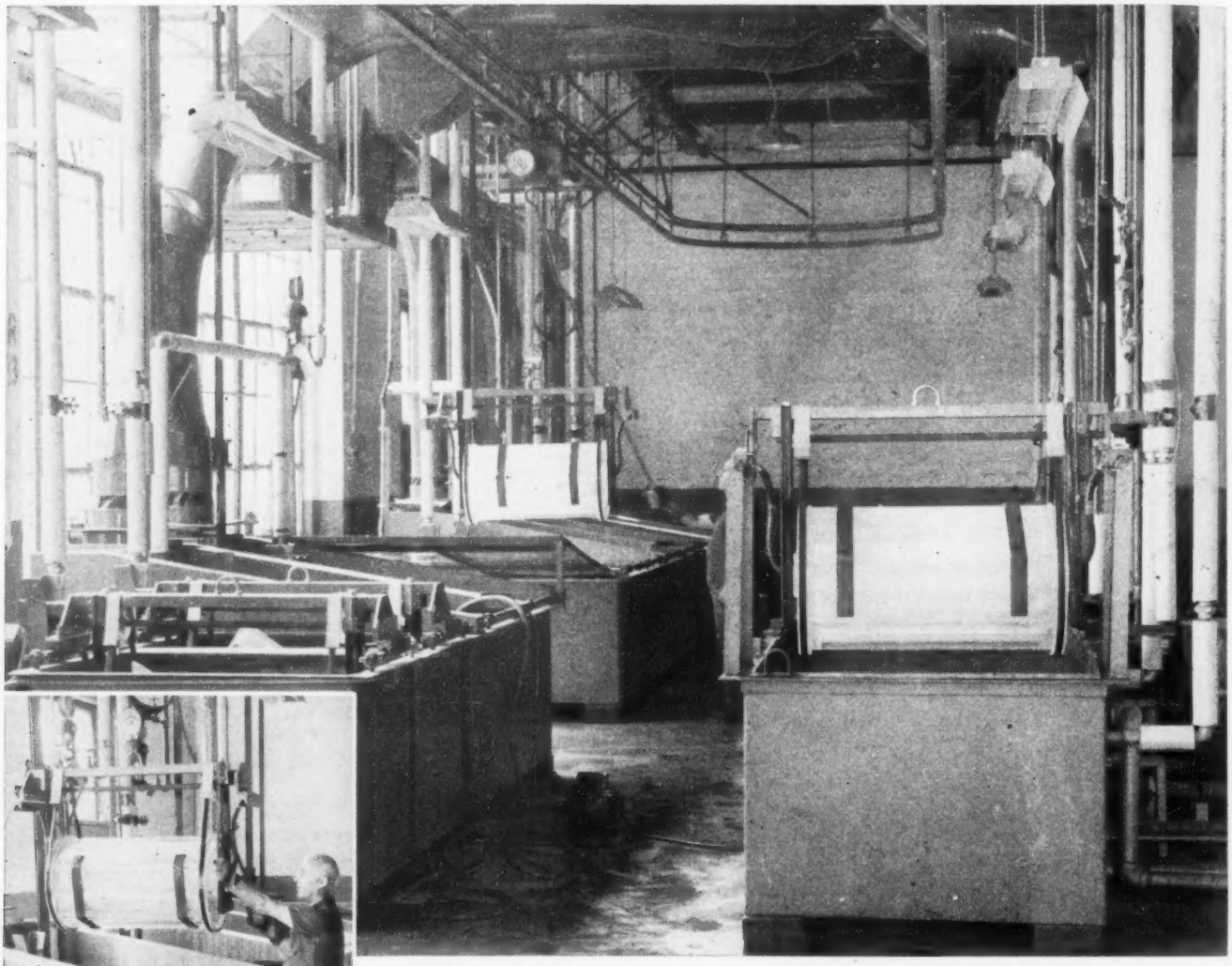

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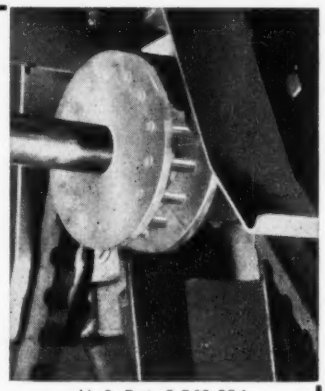

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MARCH, 1957 Volume 55 Number 3

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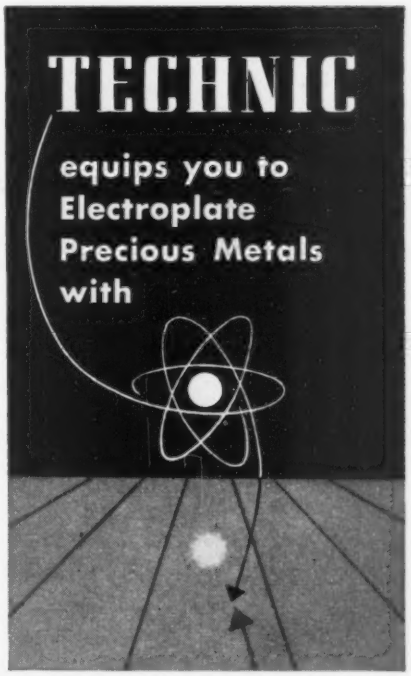

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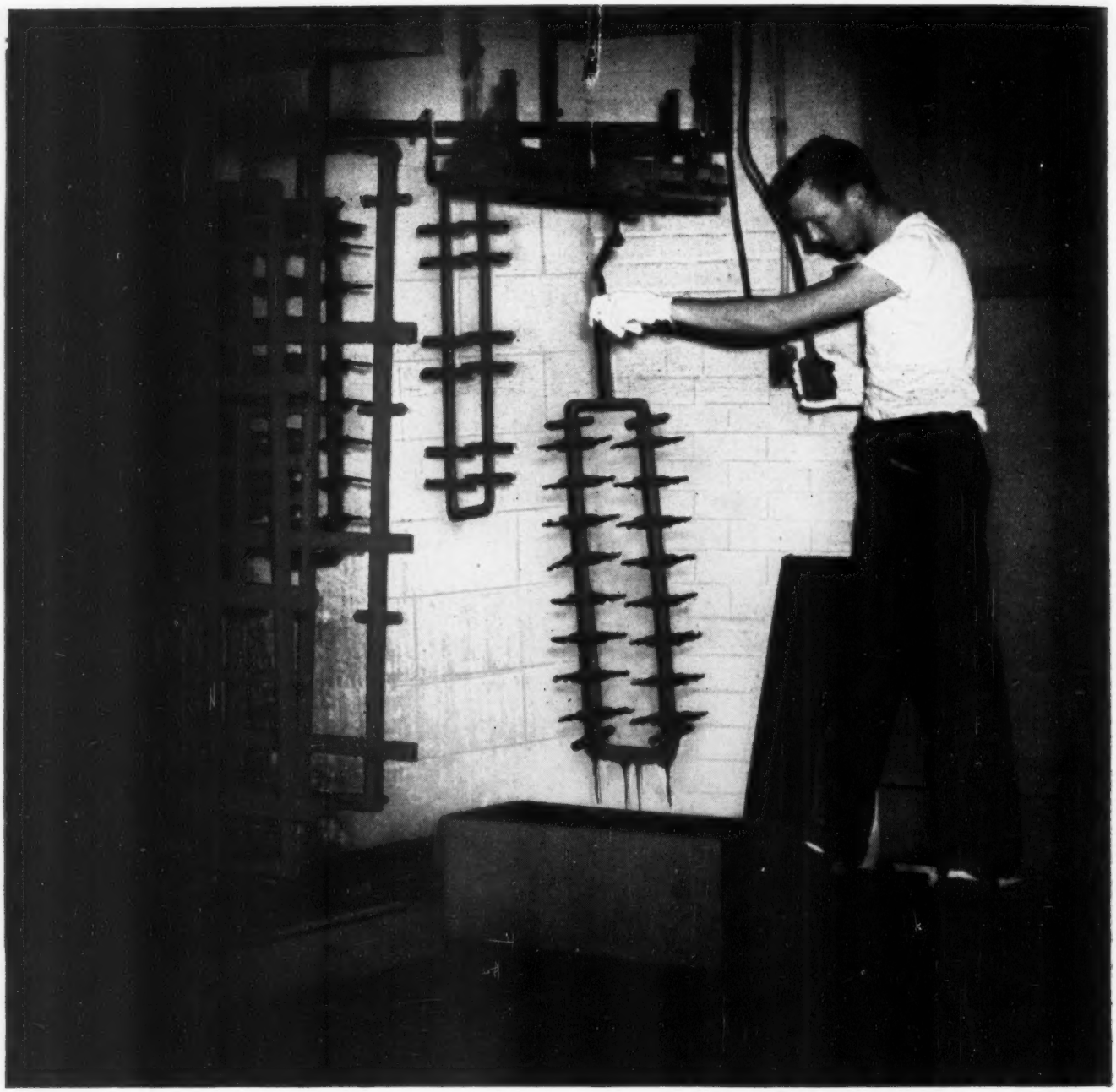

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Nickel Distribution — The Next Step

About a year ago we started to accumulate a folder of published reports, releases, pronouncements, promises, and just plain gripes concerning the distribution of nickel. When the bulging collection reached a thickness of almost two inches we decided to throw it out and start over, since the prospect appeared quite certain that we would be able to fill another this year without any trouble at all. So far we haven't been disappointed.

The *National Association of Metal Finishers* has gone all out in its efforts to obtain relief for its member job shops, which would mean relief for all nickel platers. Its crowning success was to obtain an inquiry into the supply and distribution of the metal by a Senate committee, which investigated the matter, held public hearings, and submitted a report. The committee, as was to be expected, found that the electroplating industry has not been receiving an equitable share of the available supply of non-defense nickel; on the contrary, it has borne the brunt in periods of very short suply and has been last to receive increases in times of greater supply. It agreed that the Government has a firm responsibility to insure the equitability of the system of distribution. It decided that "available data as to the structure of the nickel-consuming industry and the distribution of non-defense nickel are woefully inadequate," which is only a fancy way of saying that producers and suppliers were unable or unwilling to disclose just how they were apportioning the supply. It felt that the allocation systems now in use can only succeed in compounding confusion and present inequities. And, it concluded that real relief for small users of nickel can be brought about only through increased nickel production.

This last we consider a really helpful suggestion. All we have to do is wait! Free world production has been increasing every year but every plater we speak to has been getting less nickel. There was more than a 5 per cent increase between 1956 and the previous year but did you get any more? Perhaps at this rate, if production can be increased sufficiently, the plater will reach a point where he gets no nickel at all!

We concur with the committee's conclusion that the Government has a responsibility to insure equitable distribution. It has shirked this responsibility by delegating the power of allocation control to the very people it should have been controlling, the producers and suppliers. To assist in tracing anodes found in the possession of unauthorized persons, the committee suggests that anode manufacturers apply identification marks, a suggestion we made on this page a long time ago to nickel-platers for the purpose of making more difficult the disposal of stolen goods. Now we'll see if even this simple but effective action will be taken. So far it hasn't been. If all the $2.50 and $3.00 per lb. nickel anodes offered on the market last year came from Japanese and French sources, these countries have sources which they have been able to keep a deep, dark secret from the rest of the world!

Nathaniel Hall

PLATING WITH INSOLUBLE ANODES

Counteracting the Effects on a Silver Plating Solution

By Edward R. Jorczyk, *Special Process Engineer, Lycoming Div., Avco Mfg. Corp., Stratford, Conn.*

E. R. Jorczyk holds degrees from the University of Bridgeport (A.S. 1948, New York University (B.A. 1949) and Boston University (M.A. 1951) in both Chemistry and Biology. Association with the electroplating industry began in 1951 when he joined Columbia Records, Inc. as a plating chemist. In 1952 he joined Avco-Lycoming, Stratford, Conn. as a chemist and is presently employed there as a special process engineer (Electroplating and Heat Treating). He is a member of the New Haven Branch, AES.

Introduction

THE use of insoluble anodes in a silver cyanide plating solution depletes the silver from the bath with the formation of cyanogen, which breaks down to numerous other compounds. This deterioration is indicated by a gradual darkening of the solution from a light straw color to a deep murky brown. As the solution progressively darkens, the quality of the plate suffers. Rough, porous and nodulated, the deposit exhibits a lack of bond which occurs at the final stages of solution decomposition. The only remedies for a bath in this condition are a thorough carbon treatment to remove cyanogen break-down products or else a new bath has to be made up.

Valuable production time is lost and additional expense is incurred when the plating solution has to be carbon treated or made up new. When insoluble anodes are used, large additions of silver cyanide are needed daily to replace the silver plated out of solution.

The installation of a silver concentration tank into the production line at Lycoming Division of Avco Mfg. Corp., contributed to a better quality silver plate, increased production, and lower operating and maintenance costs. These were achieved only when insoluble anodes were used throughout the process.

The advantages of an installation of this type are:

1. When plating with insoluble anodes, solution decomposition is virtually eliminated and the solution remains a clear straw color.
2. The silver content of the solution can be maintained even though the parts are silver plated in a bath containing insoluble anodes.
3. Silver metal in any form can be used in place of silver cyanide, or soluble silver salts, to increase the silver content of the solution.
4. Carbon treatments or solution reclaim can be kept down to a minimum.

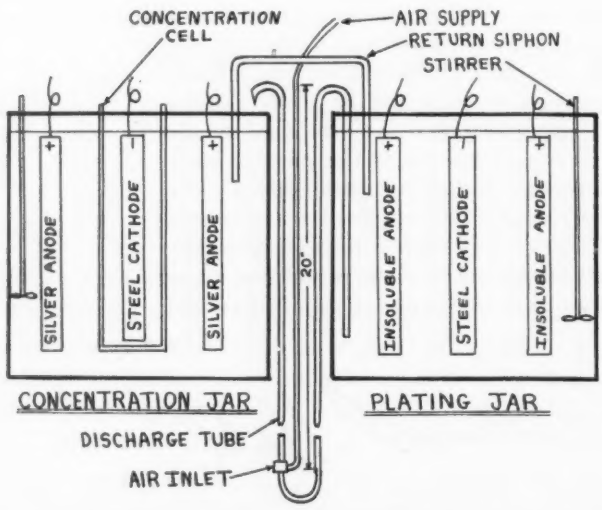

Fig. 1. Laboratory model for silver plating with insoluble anodes in conjunction with a concentration cell.

Basic Principle

The silver concentration tank employed at Lycoming is primarily a plating tank with the exception that the cathode is surrounded by a cell which has a semi-permeable diaphragm. A stainless steel cathode is used inside the cell. The diaphragm will permit the passage of an electrical current but silver ions will not pass through. Therefore, instead of silver plating out on the cathode, hydrogen gas will be given off. The concentration of silver will increase in the solution outside the cell and the free cyanide content will decrease as the metallic silver combines with potassium cyanide at the anodes to form potassium silver cyanide. By calculation it is possible to place into solution a definite amount of silver metal over a given period of time. When the concentration tank is connected to the plating tank with a suitable piping arrangement an equivalent amount of silver can be placed back into solution at the same time as it is being plated out of solution, even though insoluble anodes are used.

Cypress wood panels, aluminum oxide pots, glass mats and porous rubber have been employed as semi-permeable diaphragms. Aluminum oxide pots may not be desirable in a production line because of their fragility and cost. The possibility of the aluminum oxide being attacked by the potassium hydroxide in the bath was also considered. A cell utilizing cypress

wood panels gave results comparable to those obtained with an aluminum oxide pot. A production size cell made from acrylic plastic and utilizing cypress wood as the diaphragm was constructed, based on experimental data obtained from a small laboratory model cell. Diaphragms made of glass mats or porous rubber were not investigated.

The following silver plating solution was used:

Silver as metal	11.0 oz./gal. (avoir.)
Free potassium cyanide	10.0 "
Potassium hydroxide	2.0 "
Potassium carbonate	2.0 "
pH	12.5 to 13.5
Brightener	As needed
Temperature	Room

The above make-up is a typical high speed industrial silver plating bath. Any other silver cyanide bath may be used provided that potassium hydroxide is present in concentrations ranging from one to two ounces per gallon. An electrolyte of 16 oz./gal. potassium cyanide was found to be the best suited for use inside the concentration cell.

The Laboratory Model

A laboratory model of a silver concentration tank and plating tank, which will closely simulate the results obtained with production equipment, can be easily assembled and operated. Two glass jars, each with a capacity of at least two gallons, will represent the plating and concentration tanks. Silver plating solution is placed into each of the two jars until the solution level is within two inches of the rim.

The next problem is to circulate the solution from one jar to the other and then back again. This can be accomplished by one of two methods depending upon equipment available. A small circulating pump may be used to transfer the solution from one jar to the other. The solution is simultaneously returned to the first jar by means of one or more siphons between the two jars. If a small circulating pump, which has a flow of about 20 gallons of solution per hour, is not available, then the second method, which was used successfully by the writer, may be used providing a source of compressed air is available. The compressed air line must be equipped with a pressure regulator and a needle valve. Solution movement from one jar to the other and then back again is accomplished by one discharge tube, which is operated by compressed air, and one or more return siphons. The discharge tube and siphons can be made from glass or plastic tubing. The interior diameter of the discharge tube should not exceed $\frac{3}{8}$ inches. The length of the discharge tube from the rim of the glass jar to the point where the compressed air enters is approximately twenty inches as shown in Fig. 1.

Fill the discharge tube and return siphons with plating solution and carefully place the ends into their respective jars so that the column of water in the siphon portions of the tubes is continuous. Slowly open the valve allowing compressed air to enter the discharge tube. As the air bubbles through this tube it will cause the solution in the tube to move along with it. As the solution level rises in the concentration jar it will be returned to the plating jar by means of a siphon, so that, the solution levels are maintained between the two jars. More than one return siphon may be necessary in order to keep the levels between the two jars approximately the same. It is possible to circulate up to 50 gallons of solution per hour by introducing compressed air into the base of the discharge tube. This type of solution movement would be undesirable in production because of the air bubbles introduced into the solution.

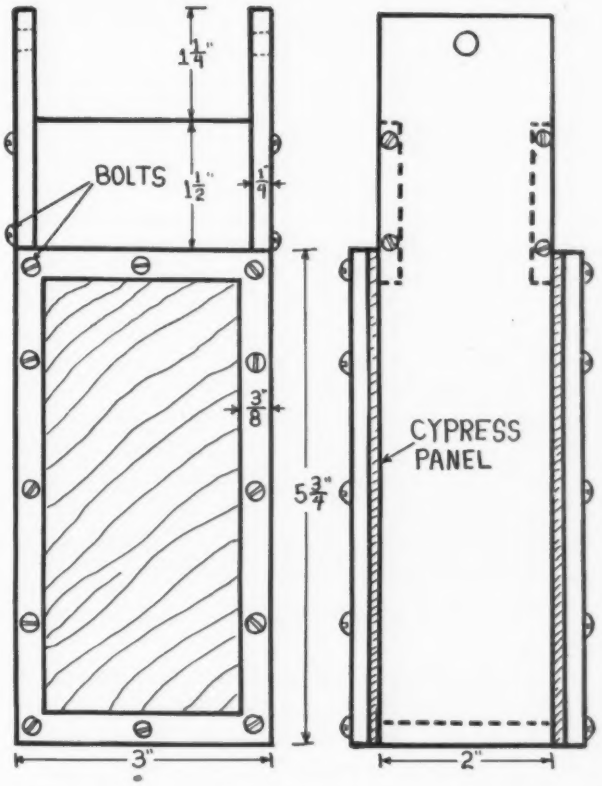

Fig. 2. Laboratory model concentration cell showing dimensions.

The concentration cell is made from ¼ inch thick acrylic plastic and fitted with ⅛ inch thick cypress wood panels as shown in Fig. 2. When completely assembled the cell should be solution tight. Fill the cell with the potassium cyanide electrolyte, making sure that the cypress wood has been deresinized, and place it in the center of the concentration jar. A 7" x 1½" x $\frac{1}{16}$" stainless steel cathode is placed inside the cell. Place silver anodes on the sides of the jar in such a manner that they face the cypress panels. Connect the anodes and cathode to the power source. Current densities are the same as those used when silver plating. The solution is circulated within the concentration jar by means of a mechanical stirrer. When the concentration jar is operated, silver will be placed into solution from the anodes and hydrogen gas will be given off at the cathode. A relatively small amount of silver may be deposited on the cathode due to irregular pore size of the cypress wood diaphragm. Theoretically 4.025 grams of silver will be placed into solution per ampere-hour or 0.142 oz./amp. hr.

To determine the effect of plating with insoluble anodes which will cause the solution to darken and deteriorate, and whether the concentration cell will counteract the effect, it is necessary to operate the plat-

ing jar. Place two stainless steel anodes and a steel cathode in the plating jar and connect them to the power source. As long as circulation of solution between the two jars is maintained and the amperage to each jar is the same, the solution will remain a clear straw color. If circulation between the two jars is stopped then the solution in the plating jar will darken and the silver content of the solution will be depleted as it is plated out of solution. Darkening of the solution will occur much more rapidly if potassium hydroxide is omitted from bath composition. The solution in the concentration jar will remain a clear straw color but the silver content of the solution will increase with a loss of free cyanide. Once the plating solution darkens it is not possible to return it to its original straw color by means of the concentration cell. This can only be accomplished by treating the solution with activated carbon.

With the laboratory pilot model it is possible to evaluate the following:

1. Effect of insoluble anodes on the silver plating solution.
2. Counteracting the effects of insoluble anodes on the solution by means of a concentration cell.
3. Increasing the silver content of the solution by the use of silver metal and an electrical current.

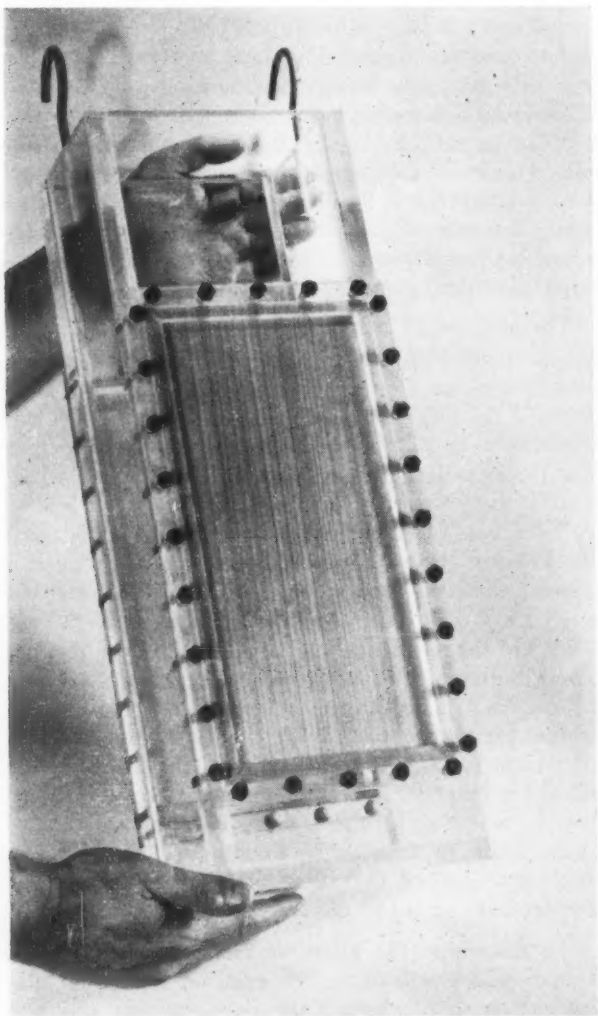

Fig. 3. Concentration Cell.

Production Application

The purpose of the concentration tank is twofold. The concentration tank may be used to convert metallic silver to potassium silver cyanide. Silver metal in the form of stub anodes, clean silver scrap or production anodes may be used. The use of stub anodes or scrap will result in an appreciable saving, obviating refining and recasting into anodes. The concentrated solution of potassium silver cyanide may be added to other silver plating solutions if it is necessary to increase their silver content. The primary purpose is to counteract the detrimental effects of the insoluble anodes on the solution and to replace the silver metal back into solution at the same rate at which it was plated out.

In either case, it is necessary to install another tank which will contain the concentration cell. Accessory equipment needed for the installation would be essentially the same as that used on a silver plating tank. Anode and cathode bars, rheostat panel, power source, and a mechanical stirrer are needed. It may be desirable to install ampere-hour meters on both the concentration and plating tanks. This will eliminate any guesswork concerning the amount of metallic silver plated out of solution or placed into the solution by means of the concentration cell.

There are various equipment arrangements and modifications that can be used to suit specific installations. The one presented here is a successful installation based on available space and minimum interference with production.

The Lycoming installation consisted of two 200 gallon tanks which utilized insoluble anodes, and were being used to silver plate steel bearings. A 90 gallon tank was found to be available for employment as a concentration tank. This tank was set on a wooden platform next to the silver plating tanks so that the solution level in this tank was approximately 22 inches higher than the level in the plating tanks. Solution was pumped simultaneously from the two plating tanks through a circulating pump, rated at 100 gallons per hour, into the concentration tank. The delivery hose from the pump was placed over the rim of the concentration tank and extended five inches into the tank. If the hose were extended to the bottom of the tank then the solution would siphon back to the plating tanks when the pump was turned off, causing them to overflow. Solution return to the plating tanks was accomplished by gravity flow through an opening four inches from the top of the concentration tank which was fitted with a "T" connection. Return hoses to the plating tanks were attached to the "T" connection. The delivery and return hoses have valves to equalize the solution flow between the two tanks.

The solution flowing into the plating tanks from the concentration tank has a tendency to introduce bubbles of air into the bath. This problem was overcome by placing a long rectangular box with its long side vertical and open at the top and bottom in one corner of the plating tank into which the solution would discharge. Air bubbles are thus prevented from entering

the main bath and escape at the surface while a solution free of bubbles enters the bath through the bottom opening of the box.

Concentration Cell

A production size cell can be constructed of acrylic plastic or any other suitable material which is nonconductive. The material used in constructing the cell must not deteriorate or contaminate the solution. The cell used by the writer, shown in Fig. 3, was constructed from ½" thick acrylic plastic to which two cypress wood panels were attached by means of unplasticized poly-vinyl chloride bolts. Approximate outside dimensions of the completed cell measured 20" x 7" x 5". An 18" x 5" x $\frac{1}{16}$" stainless steel plate, to which is attached a cathode hook, is used as a cathode inside the cell. The cell, when assembled with the cypress panels in place, must be solution tight.

The diaphragm utilized in the concentration cell is a 6" x 12" x ⅛" cypress wood panel. It should be free of cracks and knots, have a fine tight grain and be sanded smooth on both sides. The panels must be deresinized before they can be used. This is easily accomplished by soaking them for 2 or 3 days in a 10-15 percent solution of potassium hydroxide at room temperature. The panels must also be weighted down to prevent warping. Replace the hydroxide solution with water and change water as often as necessary until the water remains clear and is no longer colored brown by the resins. Store panels under water until they are ready to be used. Do not allow panels to dry out for they will warp and crack and be rendered useless.

For production use, a number of smaller cells utilizing two panels were found to be more satisfactory than one large cell having six or more panels. A small cell is easier to handle and service. A crack or puncture in one panel would cause the cell to be useless, because the crack would provide a path for the silver ions to reach the cathode. If a number of cells are used and panel cracks in one cell then it is possible to operate the concentration tank with the remaining cells until the defective cell is repaired.

With the installation described, three concentration cells were placed on the cathode rod of the concentration tank. Inside of each is placed a stainless steel cathode making contact with the cathode bar. Stub silver anodes, when available, are placed in anode baskets which face the cypress wood panels in the concentration cell. Circulation is started between the plating tanks and the concentration tank. A slowly revolving mechanical stirrer is turned on in the concentration tank in order to prevent polarization. The silver plating tanks are loaded with the parts to be silver plated and the amperage to each tank is adjusted. The amperage to the concentration tank is adjusted by means of a rheostat so that it equals the amperage to the parts being plated. When the parts are plated to the specified thickness they are removed and the concentration tank is shut down. When properly operated, only small additions of silver cyanide or else none at all will be needed on a weekly schedule.

Limitations

One concentration cell utilizing two 6" x 12" x ⅛" cypress wood diaphragms will easily conduct 50 amperes. The number of cells required for a production installation is determined by the total amperage applied to parts being plated using insoluble anodes. Potassium hydroxide accumulates within the cell while it is operating and may reach a concentration of 15 oz. per gallon in two weeks. A small quantity of silver does pass through the diaphragm and will deposit on the cathode as a sludge. This sludge has a tendency to fall to the bottom of the concentration cell. It was found necessary to remove the cells from the tank every two weeks and replace the potassium cyanide electrolyte. If this is not done, the hydroxide that accumulates within the cell will appreciably shorten the life of the diaphragm. Silver sludge should not be allowed to accumulate to such an extent that it shorts out the stainless steel cathode and diaphragm. If this does happen silver will start plating on that portion of the diaphragm that is shorted out. If any small nodules of silver are plated out on the diaphragm they should be carefully removed. If metal is used in the construction of a cell it must be carefully insulated for, if it is not, then it will be the path of least resistance and will act as a bipolar anode. Silver will rapidly deposit on the exposed metal surface and the cell will quickly become inoperative.

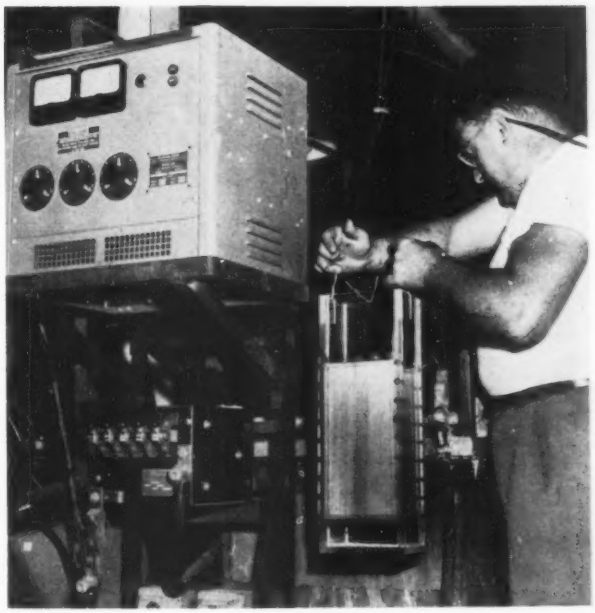

Fig. 4. Operator positioning a concentration cell into the concentration tank.

A silver concentration tank has certain advantages and disadvantages. These can be thoroughly evaluated only by a thorough laboratory investigation as affected by individual production problems. This paper has described a successful laboratory investigation of an existing problem, its solution, and the application of the principles to factory production.

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Finishing Nickel and High Nickel Alloys

By Lester F. Spencer, *Consultant, Milwaukee, Wis.*

Introduction

WROUGHT nickel along with the two widely used alloys of nickel, Monel and Inconel, will be under consideration. Wrought nickel, as used in industry, is the commercially pure metal; it is specifically known as "A" nickel and generally referred to as "Nickel." This designation distinguishes it from electrolytic nickel and from nickel base materials that may contain minor quantities of alloying elements which may be added to impart special properties. Commercial nickel will respond quite readily to all of the commercial fabricating operations and its use in both the chemical and food processing industries is well known. It is a material of considerable merit on the basis of excellent mechanical properties and corrosion resistance.

Monel, which is a useful alloy of nickel and copper containing 67 percent nickel and 30 percent copper, has a combination of high strength, ductility and excellent resistance to corrosion. One of its outstanding characteristics is its ability to withstand salt water corrosion which makes it a general purpose alloy for marine applications. Another standard nickel base alloy is Inconel which contains 78 percent nickel, 14 percent chromium and 6.5 percent iron. Due to its ability to resist oxidation, typical applications of this alloy would be its usage as exhaust manifolds in aircraft engines, as sheathing in electrical heating elements and as materials of construction when heat is realized during operation. The excellent corrosion resistance of this alloy permits a wide usage in both the chemical and food processing industry. Both of these alloys are readily formed in the conventional methods available.

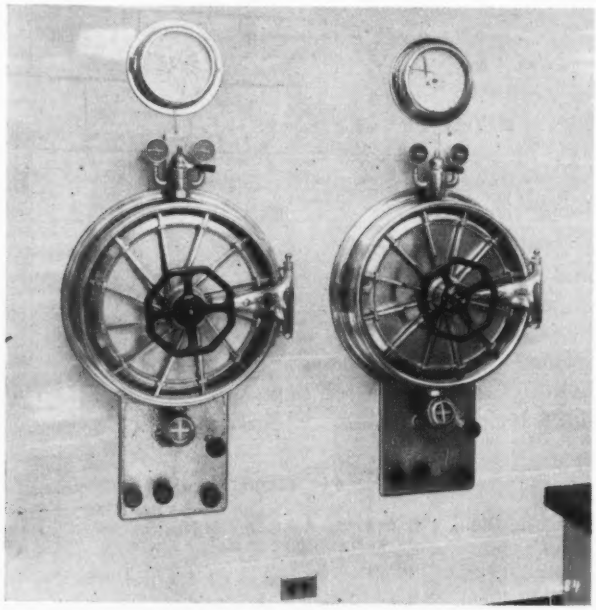


Fig. 1. Sterilizer made from Monel metal, front panel view.

All three of these materials may be finished to any of the mechanically produced effects obtainable on white metal, from a sand blast finish to a highly lustrous mirror finish. As in the finishing of other materials, a planned series of operations are required to produce a smoothly polished surface on these high nickel alloys; the operational procedure will depend on (a) the item to be polished; (b) the desired final finish; and (c) the polishing equipment available to do the work. Special cold rolled sheets and articles made from them obviously can be polished with fewer operations than the standard cold rolled sheets. A "satin" finish, which blends out any surface defects, can also be produced with minimum of operations in less time than that required to produce a mirror finish.

Where a mirror finish is desired, no short cuts can be taken. The first step would consist of obtaining a "base" from which all surface defects are removed; the buffed surface is then developed from this base. The coarser the wheel used to obtain this base would mean that the operations required to obtain a mirror finish would increase. Thus, each successive operation must remove the wheel marks produced in the immediately by preceding operation. The time saving and cost saving items in finishing metal are proper selection, preparation and care of wheels, and the use of the best polishing and buffing compounds.

Specific recommendations will not be made since both the speed of the polishing wheel and the type of work must be considered; however, good wheel selection is essential and it will pay to purchase the best. The wheel manufacturer should be consulted for specific applications. However, general recommendations will be made as to wheel type, wheel speed, etc., which may be helpful as a guide. As in the working of many of the high alloyed materials, pressure must be carefully watched. Thus, Monel, nickel, and especially Inconel are poor conductors of heat; a disregard of this precaution will result in a discoloration of a buffed article, and also may result in a warpage of flat, light gauge articles.

Operational Procedures

ROUGHING DOWN WELDS:

Rubber bonded wheels have excellent cutting effectiveness in a roughing operation on both Monel and nickel and, in addition, their relative softness will decrease the tendency toward overheating. Besides the buckling of light gauge sheet, excessive heat build-up has been known to cause cracking in welds. The harder Inconel alloy requires a vitrified bonded wheel. In the roughing of light beads, a No. 36 grit wheel is usually employed, whereas, a heavier bead may require a No.

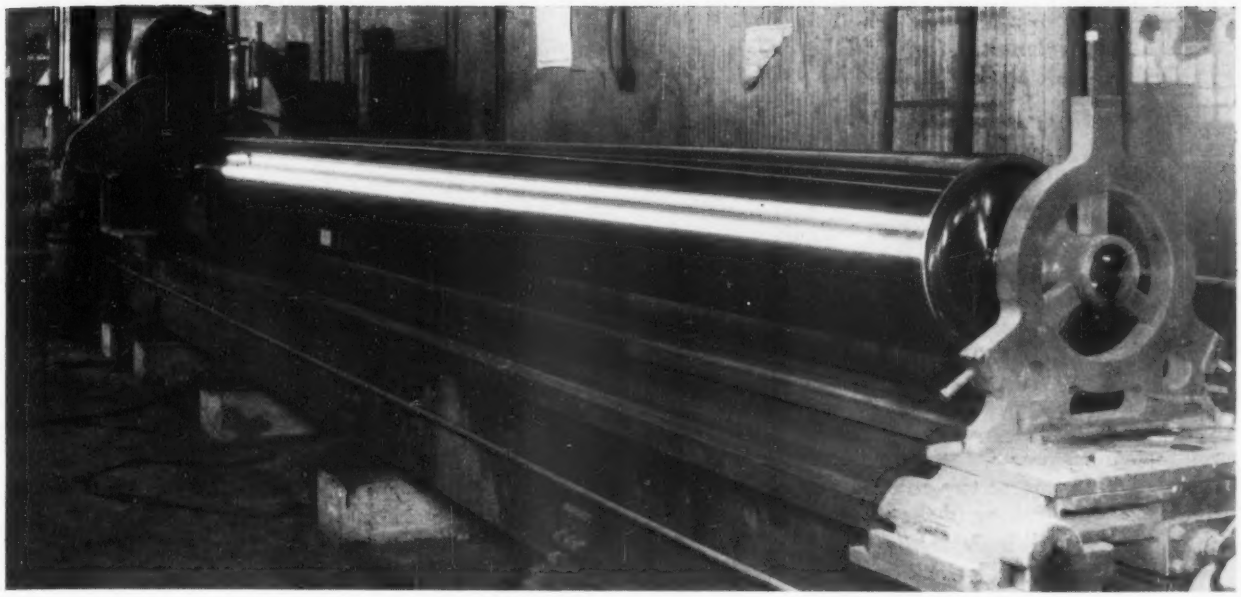


Fig. 2. Monel covered paper machine rolls after polishing. This roll is 15" diameter by 242" face and serves as a wire return roll.

24 grit wheel. Narrow wheels, the wheel width being approximately the same as the width of the weld bead, are used frequently along the direction of the weld bead. This operation is then followed by a finer abrasive wheel which is operated across the weld.

Rubber bonded wheels are usually operated from 8000 to 9000 sfpm (surface feet per minute). The vitrified wheel is operated at a slower rate of speed, usually 5000 to 6000 sfpm. To obtain this surface speed, the standard 6 inch diameter wheel with 1 inch face on portable equipment will operate between 3000 and 6000 rpm. Cup or cone shaped rubber bonded wheels are available, and have advantages over flat faced wheels for flat work, fillets and curved corners.

POLISHING:

Perfectly balanced, spirally machine-sewed wheels of tightly woven, unbleached cotton fabric are recommended for "roughing" and "dry fining." Sections that are ¼ inches thick are cemented together to the desired width; the soft cushioned face required to prevent chattering is obtained by applying the glue to within ½ to 3 inches of the periphery, depending upon the wheel diameter and the type of work being done. Fine grit wheels require more of a face cushion than coarse wheels. Should a wheel be too hard, it can be softened by removing the emery head and thoroughly soaking the face by rolling the wheel in a pan of warm water. This weakens the glue. Another head should not be rolled on the wheel until it is thoroughly dry.

In a "greasing" operation, a more flexible and resilient wheel is advisable; however, one wheel type is frequently used for all polishing operations. A spirally machine-sewed wheel, of 64-68 count unbleached sheeting, is used for this operation, more cushion being required than in the coarser polishing operations. Grease coloring may be done on a full-disc, quilted sheepskin wheel, or a spirally-sewed wheel made from fine count (88-88) heavy sheeting. When bobbing is done with emery grout in one operation, a walrus leather wheel is recommended. If bobbing is done in two operations, the second operation should be done with a medium density felt wheel. Pressure requirements on felt wheels are less than that used with walrus wheels.

An emery roll head wheel should operate between 6500 and 7500 sfpm. At slower speeds the metal drags, while at excessive speeds the wheel will lose abrasive. Excessive pressures will wear down a wheel and also creates undue heat. Just sufficient pressure should be exerted against the wheel to feel the grip of the abrasive. It is not necessary to use roll head wheels in polishing; the work may be done satisfactorily with portable grinders, using special rubber sanding drums upon which emery or artificial abrasive sleeves are fixed.

BUFFING:

Buffing wheels, which depend on multiplicity of thread and stiffness for cutting action, should be made of closely woven, high-count sheeting. Close weaves give good cutting, and heavy threads give good coloring. Pocket type wheels, because of their added stiffness, are desirable for grease coloring and buffing. This operation is frequently divided into two operations, cutting down and coloring.

Cutting down operations, performed with tripoli or double duty compounds, will give a sufficiently bright finish for some applications. A spirally, machine-sewed buff of 64-68 count unbleached sheeting, with loose sections, is used for the preparation of one recommended wheel, while the second recommended wheel type is the full-disc wheel fabricated from high

TABLE 1

Nominal Compositions of Nickel Alloys

	Nickel	*Monel*	*Inconel*
Nickel	99.4 %	67.0%	78.5 %
Copper	0.1 %	30.0%	0.2 %
Iron	0.15%	1.4%	6.5 %
Manganese	0.2 %	1.0%	0.25%
Silicon	0.05%	0.1%	0.25%
Chromium	----	----	14.0 %
Carbon	0.1 %	0.15%	0.08%

TABLE 2

Glue Requirements for Polishing Wheels

Size of Abrasive	% Dry Glue in Solution by Weight
30	50
36	45
46	40
60 to 70	35
80 to 90	33
100 to 120	30
150 to 180	25
220 to 240	20

TABLE 3

Approximate Spindle Speed in Rev./Min.

Surface Speed of Wheel in Ft. per Min.	Diameter of Wheel 6"	8"	10"	12"	14"	16"	18"
1,000	1930	1450	1150	950	820	710	640
2,000	2550	1900	1500	1300	1100	950	850
5,000	3200	2400	1900	1600	1375	1200	1050
5,500	3500	2600	2100	1750	1500	1300	1175
6,000	3800	2850	2300	1900	1650	1425	1275
7,500	4800	3550	2850	2400	2100	1800	1600
8,000	5100	3800	3100	2550	2200	1900	1700
9,000	5750	4300	3450	2850	2450	2150	1900
10,000	6400	4750	3800	3200	2750	2400	2100

counting sheeting. The wheel is sewed only around the arbor hole and one or two rows midway between the arbor and the periphery of the wheel. The usual practice is to use sewed buffs for "cutting-down," and the loose disc buffs for "coloring" operations. Since coloring operations have no cutting qualities, the surface of the metal must be prepared so that a mirror finish is obtained. A loose-disc canton flannel wheel is recommended.

Since buffing-wheel sections are not glued together, they are flimsy and ineffective unless operated at a sufficiently high speed to give them the required stiffness. Thus, the recommended wheel speed for coloring is at 10,000 sfpm; cutting-down operations with spiral-sewed buffs is done between 8,000 and 9,000 sfpm. If the article to be buffed is small or irregular, the speed may have to be reduced from the recommended value. This may also hold true depending upon the buffing compound that is used. Since high surface speeds are required in buffing operations, it is advisable that the pressure be watched carefully. Thus, the tendency is to overheat, which will necessitate less pressure than that used in polishing so as to minimize this danger.

BRUSHING:

The Tampico wheel, because of its flexibility, is more suitable for work with irregular contours. Since, when used with emery cake, it smooths down all previous abrasive scratches, leaving the surface ideal for buffing, it is taking the place of the old bobbing operation in the cycle of operations for developing a mirror finish. If the grease wheel is well broken in, the Tampico operation may frequently be eliminated; however, if a new grease wheel is used, the Tampico wheel charged with emery paste is a required step before buffing.

A Tampico wheel used with emery paste or grout is also used as a final operation to produce a satin or scratch brush finish, and with pumice and water or pumice and oil for a butler finish. Tampico wheels charged with emery paste are also used for polishing backgrounds which cannot be reached with a polishing wheel. For wet work, a wooden hub Tampico brush should be used; for dry or grease work the regular Tampico sections are suitable.

Wire brushes are used in sheet metal finishing as a final operation for producing a satin finish. Since they do not remove deep scratches or blemishes, the surface should be prepared by a polishing operation prior to wire brushing. In addition, since wire particles embed in the finished article during wire brushing, it is advisable to use a Duranickel wire brush; the standard steel wire brush will eventually rust, while embedded brass may cause a yellowish tinge. Wire brushes should be cleaned frequently with pumice stone, and the wheel should be reversed on the shaft from time to time to keep the wires straight and sharp.

In either Tampico or wire brush finishing, the speed recommended is between 1,200 and 3,000 sfpm, depending upon the effect desired. If a Tampico wheel with emery paste is used instead of a bobbing operation before buffing, a speed of 3,000 sfpm is used. A slower speed is employed for a final Tampico brushing. A bright, wire brush finish requires a fine wire brush (0.004-0.008" diameter wire) operated at about 4,000-6,000 sfpm; a matte finish requires a heavier brush and slower speeds; whereas, a satin finish requires a hanger brush operating at a speed of 4,000 sfpm. Wire brushing operated at too low a speed will produce coarse, undesirable scratches. Brushing creates very little heat.

BOBBING:

A bobbing or grouting operation uses either a small walrus leather or a felt wheel with a grout mixture. The normal operating speed is about 5,000 sfpm.

Materials Used for Finishing

PREPARATION OF WHEELS:

One of the more important phases in finishing operations is the preparation of wheels; this would include the purchase and preparation of the glue. Below are outlined a few of the more important "do's" and "don'ts" on the preparation of glue and roll head polishing wheels, thus:—(a) Purchase first run hide glue from a reputable source; (b) Soak dry glue in the recommended amount of pure water until it jells; this soaked glue is referred to as "stock"; (c) To a predetermined amount of stock add sufficient clean water to obtain the desired consistency, and heat in a covered double boiler to an even temperature at 140-150°F. Stir glue occasionally while heating; burned or stale glue is useless; and, (d) Various sizes of grits require different concentrations of glue solution; Table 2 will serve as a guide. Various cold cements are also available for many applications in polishing with set-up wheels.

A recommended procedure in making up new wheels

is given as:—(a) Coat face and sides of wheel with a thin sizing glue; (b) Heat both wheel and glue to about 120°F. before applying glue and grit. Bear down when rolling on abrasive head; (c) A wheel should have two heads, the primary head to be made of a finer grade of grit than the working head. The primary head must be thoroughly dry before the working head is applied; (d) A drying period of 48 hours should be given after the working head is applied; recommended drying conditions include a temperature of 85°F. and a 50% relative humidity; and, (e) On coarse grain wheels (#40-#80) apply a thin coat of glue to the surface of the wheel after it has been set up. This is not necessary on fine grain wheels.

Polishing and Buffing Compounds:

For "roughing" and "dry fining," which requires grit sizes from the coarsest down to and including No. 120, artificial abrasives are preferred; the advantage over Turkish emery for coarse polishing is that the grains fracture and thus expose sharp edges at all times. Since Turkish emery wears dull and smooth, it is more suitable for "greasing" and "grease coloring"; the grit sizes included would be Grade No. 150 or finer. Table 4 will give details of various finishing operations in a convenient reference form; the operations given will be referred to constantly throughout the text.

Polishing tallow should be used freely with fine emery wheels since it will prevent glazing and burning. Polishing tallow is graded according to its melting point; the desirable grade is one that is sufficiently hard during application and does not become too greasy. Emery grits No. 90 to 3F are used in emery grease cakes and paste. The compound is charged on full disc or spiral-sewed buffing wheels or on Tampico wheels; this operation is often used instead of bobbing. The function of emery paste is to roll down the surface preparatory to buffing. It is similar to a lapping operation.

Tripoli, which is used frequently for "cutting down" operations, is usually in cake form; the several grades of this buffing compound differ primarily in the grease binder employed, which controls the melting point of the material. The grade to employ depends entirely upon the heat generated in performing the operation, which can only be obtained by trial. Tripoli may leave a haze on high nickel alloys. A buffing compound with less grease is required in producing a bright finish.

Either aluminum oxide (Al_2O_3) or chromium oxide (green) buffing compounds are recommended for the final coloring; both of these have both cutting and coloring properties. The chromium oxide compound, which is the most expensive, is preferred for the final coloring since it produces less friction and gives a true blue color to both Monel and nickel.

There are available double duty compounds suitable for buffing cold rolled surfaces, which often eliminates the use of the finer grit abrasive polishing wheels immediately before buffing. These compounds are produced in numerous grades from No. 80 grit and finer. Greaseless compound is used extensively in producing a satin finish on deep drawn or spun articles.

"Grout" or "muck" is a composition of oil and emery. It is not sold commercially as such, but is made up by the user. Following are a few suggested combinations:

(a) 3F Turkish emery mixed with a liquid metal polish to the consistency of a thin paste.

(b) One part by weight of 3F Turkish emery, two parts by weight of 200 grit Turkish emery, and

TABLE 4

Grinding—Polishing—Buffing—Monel, Nickel and Inconel

General Terms	Name of Operation	No. of Operation	Grit	Artificial Abrasive	Turkish Emery	Wheels	Dry	Tallow or Emery Grease Cake	Compound	Speed Surface Feet per Minute	Finish
Grinding		1	#24 #36	X		Rubber-Bond Grinding Wheel or Vitrified-Bond Grinding Wheel	X			8000 to 9000 5000 to 6000	
Polishing	Roughing	2	#60 #80	X		Cotton Fabric Sewed Sections. Sections Glued Together To Give Desired Width Soft Cushion Face	X			6000 to 7500	Rough Grind
Polishing	Dry Fining	3	#100 #120	X			X			Do.	Commercial Grind
Polishing	Greasing	4	#150		X	64-68 Unbleached Sheeting. Spiral Sewing - Sections Glued Together To Give Desired Width - Softer Cushion Face Than Needed For "Roughing" or "Dry Fining"		X	Polishing Tallow or #180 Emery Grease Cake	Do.	Fine Grind
Polishing	Greasing	5	#180		X			X	Do.	Do.	Fine Grind
Polishing	Grease Coloring	6	#200 #220		X	88-88 Unbleached Sheeting - Same Construction As For Operations #4 & #5 - or - Quilted Sheep Skin Wheel.		X	Polishing Tallow or "F" Emery Grease Cake	Do.	Fine Scratch
Polishing	Grease Coloring	7				88-88 Unbleached Sheeting - Loose Spiral - Sewed Sections or Loose Disc Wheel.			"F" Emery Grease Cake	Do.	Fine Scratch
Brushing		8				Tampico Wheels			"F" Emery Grease Cake or "Grout"	1200 to 3000	Scratch Brush or Satin
Bobbing or Sanding		9				Walrus Leather Wheel. When Two Operations Required, Second Usually With Medium Density Felt Wheel.			"Grout"	5000	
Buffing	Cutting Down	10				Same As Operation #7			Tripoli	8000 to 9000	Bright
Buffing	Coloring	11				Do.			Aluminum Oxide Buffing Compound (White)	10,000	Bright
Buffing	Coloring	12				Loose-Disc Buff or 88-88 Unbleached Sheeting - or Canton Flannel.			Chromium Oxide Buffing Compound (Green)	10,000	Mirror
Special Finishes	Greaseless	13				Same As Operation #7			Greaseless Cmpd.	5500	Scratch Brush or Satin
Special Finishes	Wire Brush	14				"Z" Nickel Wire Brushes			Soap Bark Solution or Water	4000 to 6000	Wire Brush or Satin
Special Finishes	Bobbing	15				Walrus Leather Wheel			Pumice With Oil	5000	Butler or Satin
Cleaning		16				Canton Flannel Cloth (Hand Operation)			Venetian Lime (Whiting)		

one part by weight of Venetian lime or silica flour are mixed to a thin paste with a solution of three parts by volume of kerosene and one part by volume of medium oil.

(c) One part by weight of 3F Turkish emery, two parts by weight of 200 grit Turkish emery, and one part by weight of Venetian lime or silica flour are mixed to a thin paste with a solution of two parts by volume of water and one part by volume of 26-28° Baumé ammonia.

Japan Wax is used for cogging on fine emery wheels and to give luster. Venetian lime or whiting is used with a canton flannel cloth to remove grease after the final buffing operation. Soap bark powder mixed with warm water is employed in wire brush operations to obtain a smooth finish and to protect the metal. Rock pumice and carbon tetrachloride are used to remove grease from grease wheels and Tampico wheels, and to clean wire wheels.

Specific Examples of Finishing

Standard forms of production articles as in castings, forgings, sheet stock, and draw pieces, will be described as to finishing operations required to obtain a satisfactory article. Details as to wheel type, wheel speeds, or compounds will not be given since this data will be found in Table 4. This also applies to operational sequences that may be given in the text to indicate a "flow pattern" for the work type under consideration.

Special cold rolled sheets, used for cabinet work in hospital, hotel and restaurant equipment, are usually buffed with tripoli followed by either a white aluminum oxide or a green chromium oxide buff to obtain a bright, lustrous color. The best finish is obtained by (a) grease coloring with fine emery cake (7)*; (b) cutting down with tripoli (10)*; and, (c) coloring (11 or 12)*. The above schedule of operations is predicated on a satisfactory base to start finishing operations; if scratches or tool marks are present, removal is essential with either emery paper or emery wheels of the finest grit. These localized areas are then further prepared until the entire surface is ready for "grease coloring." Both Monel and nickel can be finished as above. However, Inconel, due to the initial surface condition, requires a longer polishing sequence to develop a high buff finish. This sequence is given under the discussion to follow on buffing standard cold rolled sheets.

Standard cold rolled sheets do not carry a highly cold rolled surface and, in order to obtain a high buff finish, it is essential to start with a comparatively coarse emery; usually nothing coarser than a No. 180 grit should be used. Thus, a coarse grit (over No. 180) may cause objectionable pits which will not normally appear until after buffing is started. When one proceeds from grit to grit of increasing fineness, it is essential to "cross" the direction of grinding; the grit used will then remove scratches obtained from the previous coarser grit. Thus, the operations can be outlined as:—(a) grinding with No. 180 grit, dry emery wheel; (b) greasing with No. 180 grit wheel (5); (c) greasing with a No. 200 or 220 wheel (6); (d) buffing with tripoli (10); (e) coloring (11 or 12); and (f) cleaning (16). Some polishers find that a Tampico brush wheel with fine emery cake (8) is helpful; this operation follows the final polishing operation.

Satin or brush finishes can be developed on all of these alloys. Thus, cold rolled sheets are "cut-down" with a fine emery grease wheel of either No. 180 or 200 grit (5 or 6), followed by a Tampico wheel on which fine emery grease cake has been charged (8); or by painting "grout" over the surface to be finished, and brushing with a Tampico brush.

A satin finish may also be obtained by hand operation, first by rubbing down the surface with No. 180 grit production paper, followed either by rubbing the surface with a soft felt pad dipped in medium oil and

*These numbers refer to the Operation Number in Table 4.

Fig. 3. Cafeteria serving counter, coffee urns and storage cabinets made from Monel metal.

Fig. 4. A group of four, 250 gallon pure nickel steam jacketed kettles polished to a bright commercial finish.

then in flour emery, or by wetting the metal surface with a solution of two parts of kerosene and one part of medium oil and hand rubbing with a No. 240 production paper. Since the methods described will not give a high satin finish, it is necessary to go over the surface with a buffing wheel upon which very little buffing compound has been charged. As in other finishing sequences, Venetian lime on a canton flannel cloth will remove grease from the finished sheet.

Although the wire brush will produce a satin finish, this method has not been found to give as good results as emery paste on a Tampico wheel. Wire brush finishes are usually confined to ornamental castings. If wire brushing is used, the best procedure is to keep the piece to be polished moist; frequent dipping into water or a solution of soap bark in water is recommended. This can be done by having a dip tank directly under the wire brush wheel.

Press drawn articles, such as deep drawn containers made from cold rolled Monel sheets, will have a certain amount of die scratches that must be removed. The recommended finishing sequence would be—(a) 120 grit dry emery grind (3); (b) 180 grit dry emery grind (4); (c) 180 grease wheel (5); (d) buff with tripoli or fine emery cake (10); (e) color with aluminum oxide (11); and, (f) clean (16). Another recommended procedure would be:—(a) 80 artificial abrasive, dry (2); (b) 120 artificial abrasive, dry (3); (c) 200 artificial abrasive, dry (6); (d) 200 artificial abrasive, grease (6); and, (e) buff (11 or 12).

The following operations are suggested for finishing light gauge equipment that has been welded, thus:—(a) grind off the weld bead with either a rubber-bond or vitrified-bond grinding wheel (1); (b) 80 emery dry grind (2), this being performed first over welded area and then over entire surface; (c) 120 emery dry fining (3); (d) 180 emery dry (5); (e) 180 emery, grease (5); (f) brush with Tampico and emery cake (8); (g) buff if bright finish is specified (11); and, (h) clean with whiting (16). If a commercial finish is all that is required, the procedure may be stopped after the third operation. However, in many instances, this is not the case. Thus, equipment for hospitals, hotels and restaurants require a fine scratch finish; this is obtained by following the recommended procedure with the exception of the final buffing operation. If a Tampico wheel is not available, the wheel work can be blended in by hand with a No. 200 emery cloth dipped in oil.

Polishing of high nickel castings involves methodical preparation. The initial operation would consist of chipping and coarse filing to remove all fins and risers. The casting must then be ground on a vitrified or rubber-bonded wheel which brings it down to a reasonable smooth contour, after which the following operational sequence can be done, thus:—(a) 80 emery, dry (2); (b) 120 emery, dry (3); (c) 150 emery, dry (4); (d) 150 emery, grease (4); (e) tripoli buff (10); and, (f) white finish buff (11).

The sequence of grits listed above for polishing is only a guide, and the usual variations occurring in practice will serve equally well, provided that they are founded on experience. Thus, emery coarser than No. 80 may be used; however, in most instances this is not generally advised. Others may prefer to insert a No. 180 emery after the No. 150 dry emery. After using the fine emery in grease, brushing with a fine emery cake on a tripoli wheel may often permit a savings of time on the tripoli buff. Sand blasting or wire brush is used frequently to brighten recessed areas that are difficult to reach with disc sanders or wheels. Wheels for polishing castings may be harder, and more pressure may be exerted than that normally used in sheet polishing, since there is no fear of objectionable warpage obtained in overheating.

Hot rolled rods and forgings are finished in a similar manner to that discussed for castings; the initial grinding operation with either a vitrified or rubber-bonded wheel will remove the oxide surface. A coarse grit wheel 40-60 is normally used. Further grinding is done on successively finer grits on wheels or belts, followed by buffing operations as described.

Barrel finishing, which encompasses tumbling, deburring, and burnishing operations, is used on both cast and wrought nickel alloys. Tumbling barrels are usually lined with synthetic rubber or wood. Among the carriers or rolling mediums used are aluminum oxide chips or shapes, steel balls and shapes, wood shapes, leather scraps and impregnated rubber. Abra-

(*Concluded on page* 61)

Determination of Lead in Lead Fluoborate Solutions

By Gunner Gabrielson, *AB Tudor, Nol, Sweden*

Introduction

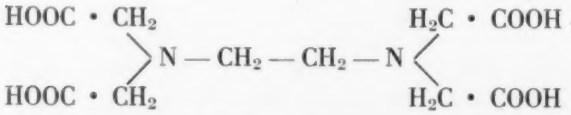
THE use of EDTA, i.e. ethylene diamine tetraacetic acid and other complexing agents in analytical chemistry has been enhanced enormously in the last few years. As an example it may be noted that a book, devoted exclusively to this topic, has been published recently.[1] Also, in the electroplating field, EDTA has been used for the determination of several metal ions. Hitherto the determination of the following metals has been reported: magnesium in nickel plating solutions;[2] zinc and cadmium in cyanide solutions;[3] nickel in nickel plating baths;[4] copper in acid copper plating as well as cyanide copper plating baths.[5] In addition, Langford reports the determination of total sulfate in nickel plating solutions by means of EDTA.[6]

It is rather seldom that the reaction at the titration of a metal ion with EDTA is specific for only that metal, since other metal ions interfere with the analysis. Sometimes it is possible to eliminate the influence of these interfering ions, e.g. through complex formation with cyanide but, in many cases, this is impossible or at least extremely difficult. As has been pointed out by Leftin,[3] however, the relatively wide variation in permissible concentration of the constituents of a plating bath makes the high accuracy usually required in chemical analysis unnecessary, an accuracy of 5 to 10% being adequate in most cases. As a result, analyses by means of EDTA titrations are of sufficient accuracy for electroplating solutions, even if some contaminating metals interfere.

As has also been emphasized by Leftin, one important factor in selecting analytical methods for electroplating solutions is the claim that it must be rapid. It is also desirable from the standpoint of the small plating shop that it ought to be performed without expensive equipment. Because of these points of views, volumetric methods using EDTA seem to be very suitable for analyses of electroplating baths, as they do not involve operations such as evaporation, precipitation, and ,filtration, which are time-consuming.

Theoretical

Ethylenediamine tetraacetic acid has the formula



As the acid is insoluble in water as well as in the common organic solvents such as alcohol, acetone, ether, benzene etc., the usual form of the product for analytical purposes is the disodium salt, $C_{10}H_{14}O_8N_2Na_2$, the solubility of which is 10.8 grams/100 ml. at 22°C., and 23.6 grams/100 ml. at 80°C.

The most important property of EDTA and that which is the basis for its use in analytical chemistry is its ability to complex formation with metal ions, so called metal chelates being formed.

The metal ions in these solutions become so firmly attached, that they lose their chemical ionic identities. As an example, it may be mentioned that calcium is not precipitated as calcium oxalate from EDTA solutions.

The use of EDTA in analytical chemistry is based upon its ability to form these strong complexes with metal ions.[7] When titrating with EDTA solutions, some dyes are used as indicators, which also give chelate complexes with metal ions; these are not so strong, however, as the EDTA complexes. The most common of these dyes is perhaps Eriochrome Black T.

Eriochrome Black T gives deep blue solutions in the alkaline range but, in the presence of several metal ions, the solution becomes wine-red owing to chelate formation. As an example we may observe the analysis of a zinc salt solution. The pH is adjusted to about 10 and a few drops of the Eriochrome Black T solution are added, coloring the zinc solution wine-red. When this solution is titrated with an EDTA solution, the red color suddenly changes to blue at the end point of the titration. This occurs when an amount of EDTA, equivalent to the amount of zinc present, has been added, since the chelation with EDTA is stronger than with the indicator. The red color of the zinc — Eriochrome Black chelate disappears at the equivalence point and the solution turns blue. The color change is very sharp and clear.

Since lead hydroxide precipitates if a lead salt solution is buffered to pH 10, a known excess of EDTA is added in this case. Afterwards, the pH is raised to 10, when no preciptation occurs, Eriochrome Black T is added as indicator and the solution is back titrated with standard zinc solution. In this way a color change from blue to red is obtained, which is also very sharp and distinct. This titration is based upon the fact, that lead gives a stronger chelate compound with EDTA than zinc.

Experimental

The determination of lead was performed according

to the general principles outlined above which have been described in the literature.[8] The solutions used were:

0.1 M EDTA solution: 37.21 grams reagent grade disodium dihydrogen ethylenediaminetetraacetate dihydrate are dissolved in 1 litre of distilled water.

Eriochrome Black T indicator: the prepared indicator solution was purchased from the supplier.

Buffer solution, pH 10: purchased from the supplier.

0.100 M zinc solution: 6.538 grams of very pure zinc metal were dissolved in about 100 ml 1:1 hydrochloric acid and diluted to 1 liter with distilled water.

The EDTA solution was standardized as follows: 10 ml. of the 0.100 M zinc solution were made alkaline through the buffer solution and 5-6 drops of the indicator were added. The solution was then titrated with the EDTA solution to be standardized until the color change from red to blue occurred. From the titration value the molarity of the EDTA solution can be estimated.

The first experiments with lead were performed with known amounts. 10.000 grams of reagent grade lead acetate, $Pb(C_2H_3O_2)_2{\cdot}3H_2O$ were dissolved in 100 ml. water, i.e. the lead content of this solution was 54.62 g./l. To 5 ml. of this solution 15 ml. of the standardized EDTA solution were added. After buffering to pH about 10 a few drops of the indicator solution were added, when the solution became blue. The amount of EDTA, in excess of that which formed the chelate with the lead, was then titrated with 0.100 M zinc solution, until the solution turned red.

The lead content is estimated as follows. In the standardization of the EDTA solution, 10 ml. 0.100 M zinc solution consumed "a" ml. EDTA, i.e. the EDTA solution is $\frac{1}{a}$ M. To "b" ml. of the lead solution "c" ml. EDTA solution are added and, in back-titrating, "d" ml. 0.100 M zinc solution are consumed. These "d" ml. corresponds to $\frac{d \times a}{10}$ ml. EDTA solution. Consequently, in the chelate formation, the lead present in the sample has consumed $\left(c - \frac{d \times a}{10}\right)$ ml. EDTA solution, which is $\frac{1}{a} \times$ M according to the above. The molarity of the lead solution is consequently $\left(c - \frac{d \times a}{10}\right) \times \frac{1}{a} \times \frac{1}{b}$ and the lead content in grams per liter $\left(c - \frac{d \times a}{10}\right) \times \frac{1}{a} \times \frac{1}{b} \times 207.21$, as 207.21 is the molecular weight of lead. This formula may look rather involved, but a numerical example will make it clear. In the titration with the lead acetate solution described above, 10.00 ml. of the zinc solution consumed 8.00 ml. EDTA solution ("a" ml.) in the standardization, i.e. the EDTA solution is $\frac{1}{8.00} = 0.125$ M. To 5 ml. of the lead acetate solution ("b" ml.) 15 ml. EDTA solution ("c" ml.) were added. In the back titration 5.55 ml. zinc solution ("d" ml.) were consumed, i.e. the lead solution consumed $\left(15 - \frac{5.55 \times 8}{10}\right)$ ml. 0.125 M EDTA. The lead content was therefore $\left(15 - \frac{5.55 \times 8}{10}\right) \times 0.125 \times \frac{1}{5} \times 207.21 = 54.70$ g./l.

Several subsequent titrations of the lead acetate solution gave the following results:

54.70 g./l.
54.91 "
54.26 "
54.49 "
54.49 "

and, as the lead was actually 54.62 g./l., the maximum relative error was less than 0.7 per cent.

The lead content of five different lead fluoborate baths was determined both by EDTA titrations, described in this paper, and by precipitating and weighing as lead sulfate. The fluoborate baths were of the common type.[9] The results are presented in the table. As is seen from the table, the agreement is very good, the maximum difference being less than 2 per cent. The analytical method described in this paper seems, therefore, to be very suitable, both in the manufacturing control of lead fluoborate solutions and for the analytical control of lead fluoborate baths.

Bath	Lead determined, g./l. EDTA titration (Method A)	Weighing as $PbSO_4$ (Method B)	Difference A — B
1	149.5	146.9	+2.6
2	100.0	99.7	+0.3
3	126.4	124.0	+2.4
4	113.3	111.4	+1.9
5	120.9	120.1	+0.8

The table also shows that EDTA titrations usually give somewhat higher values than the lead sulfate method. It is possible that this depends upon impurities in the fluoborate baths, which react like lead during the EDTA titrations. Without performing any quantitative determinations, it was found that iron and copper interfere with the analysis to a certain degree. However, in the baths analyzed above, copper articles had been lead plated for a long time. Despite this, the analyses according to the two methods gave high agreement.

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Surface Treatment and Finishing of Light Metals

Part XII-C. Plating on Aluminum — Zinc Immersion Processes

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M. and R. Pinner, B.Sc.

The Plating Sequence

A TYPICAL flow sheet for plating by the zinc immersion method is shown in Fig. 12.

POLISHING:

The aluminum is first polished if a decorative coating is to be applied. Procedures have been described previously. As it is usually necessary to polish the electrodeposit, i.e., copper or nickel, no attempt is usually made to obtain the highest possible finish. Although most aluminum is polished with a buff, wire brushing may even be used for this operation.

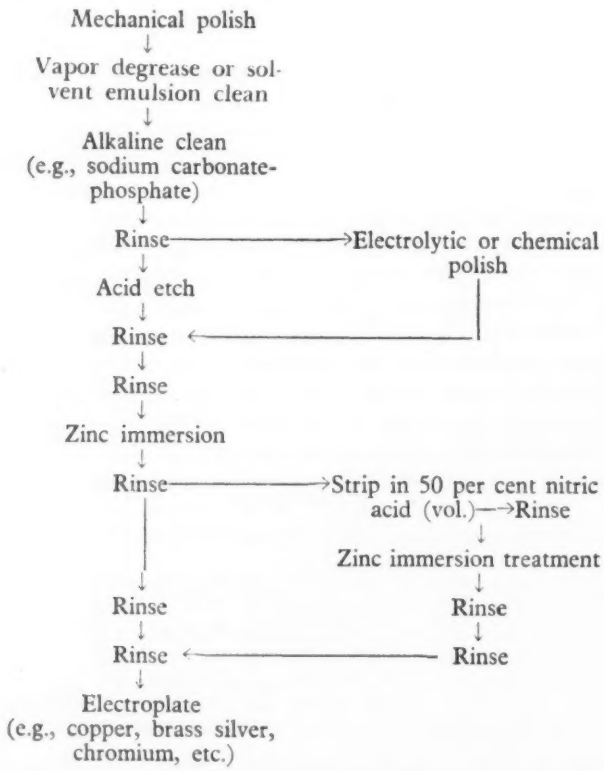

Fig. 12. Flow sheet for zinc immersion process of plating aluminum alloys.

RACKING:

Racking for plating should be carried out with care. It is important that contacts should be positive, because of the light weight of the metal. Spring contacts should be used whenever possible.

Racks should be of springy aluminum alloy from which most deposits can be removed in 50 per cent nitric acid solution. Stripping in sulphuric acid should be used for phosphor-bronze contacts or can be carried out by anodic treatment in 60 per cent sulphuric or 75 per cent phosphoric acid solution.

If racks of brass, bronze, etc., are used, they must be stopped off adequately, not only due to the risk of corrosion but also because, if left bare, the aluminum may be anodic in the zincate solution.

As compared with copper, a 40 per cent larger cross-sectional area should be used to obtain the same electrical conductivity. As a general rule, contacts should then only be of heavy metals, e.g., phosphor-bronze, if the area adjacent to the contact does not show.

CLEANING:

To obtain a consistent and uniform deposit, it is necessary to produce a clean active surface for the zinc immersion treatment. Often the work is first degreased in either trichlorethylene or perchlorethylene or in an emulsion cleaner. Whether this operation is necessary depends on the degree of contamination but, in any event, it is normally essential to precede the remainder of the sequence with an alkaline cleaner.

The formulation of an alkaline cleaner may vary. One that has been suggested for this purpose contains:

Sodium carbonate	23 g./l.
Trisodium phosphate	23 "

and is used at 140° to 180°F. for 1 to 3 minutes. Other formulations are also suitable, and have been described in an earlier section.

ACID ETCH:

After alkaline cleaning, the work is rinsed thoroughly and is then taken through an acid etch which has the dual function of removing micro constituents from the

surface and of removing the original oxide film. A number of acid solutions have been found suitable.

One of the most effective is the use of sulphuric acid 15 per cent (vol.) used at 188°F. for 2 to 5 minutes. The time depends on the alloy used, and is generally kept fairly short for castings. This etch has been proved particularly suitable for magnesium-containing alloys but gives good results on most wrought and cast alloys.

For many wrought alloys the single 1 : 1 (vol.) nitric acid dip may be sufficient and is somewhat faster as only a ½-minute immersion is usually required.

Some casting alloys containing high silicon contents are preferably treated in a solution containing:

Nitric acid	75% (vol.)
Hydrofluoric acid (48%)	25%

for 3 to 5 minutes at room temperature.

The sulphuric acid etch may be kept in lead-lined steel tanks. If the nitric-acid mixture is used, a stoneware tank or crock can be employed. The nitric-hydrofluoric acid dips may be used in polyethylene tanks. Other materials which have been used include specially-treated graphite and waxed lead.

For many wrought alloys a chromium-sulphuric acid etch has been suggested by Bengston[8] containing:

Chromic acid	30 g./l.
Sulphuric acid	150 "

This dip, operated at 65°C., is stated to give good adhesion when used for 3 minutes.

It is usually followed by a 50 per cent nitric dip. The chromic-sulphuric acid etch offers advantages over sulphuric acid but has the attendant risk of leaving an adherent chromate film on the surface.

Zinc Immersion:

The zinc immersion process itself can be carried out in solutions of various compositions, a number of which have been discussed above. Most commonly used is probably a solution made up from:

Sodium hydroxide	525 g./l.
Zinc oxide	100 "

used at 60° to 80°F. for 30 seconds to 1 minute. Commercial quality chemicals can be used. The addition to this solution of:

Ferric chloride (cryst.)	1 g./l.
Rochelle salt	10 "

has, however, been used with excellent results, particularly where the double-immersion technique is used as described above, and this solution is used under the same temperature and operating times. Where drag-out and rinsing are critical, the use of the more dilute solutions containing:

	I	II
Sodium hydroxide	50 g./l.	120 g./l.
Zinc oxide	5 "	20 "

with Rochelle salt 50 g./l., ferric chloride (cryst.) 2 g./l. and sodium nitrate 1 g./l. are used with good results. The more dilute baths are used at 70° to 75°F. and the immersion time must not exceed 30 seconds. The weight of zinc deposited will vary between 0.1 to 0.3 mg. per sq. in. and the thinner, more uniform and finer grained the deposit, the better is the adhesion obtained.

The solution used by Bailey,[15] containing zinc oxide 40 to 50 g./l., has also been used with success in many cases.

The work should be agitated when it is introduced into the solution to remove the water film uniformly.

In some cases, e.g., with casting alloys containing high silicon contents, a short zinc immersion treatment of 5 to 10 seconds may be suitable. Tanks are of steel or stainless steel. Ceramic is suitable but has a tendency to crack due to heat evolution when the solution is made up. In operation, the components should not be allowed to contact the steel tank as the aluminum may become anodic, preventing zinc deposition. The zinc deposit should be uniform in color. Spotty deposits are unsatisfactory.

Double Zinc Immersion:

Where the double zinc immersion treatment is used, the component is immersed in 50 per cent nitric acid (vol.) solution at room temperature to remove the first deposit. Subsequently it is rinsed and the zinc immersion treatment repeated.

Electroplating on the Zinc Deposit

After the zinc deposit has been formed, other metals can be plated by methods normally suitable for plating on to zinc, keeping in mind that the zinc deposit is very thin.

The metals that can be plated direct include copper, zinc, brass, cadmium, silver and chromium.

Copper Plating:

Copper is most commonly plated direct on the zinc immersion deposit and is almost always used before decorative nickel-chromium plating. As in plating on zinc-base die-castings, a Rochelle salt solution has been found most generally useful. A typical Rochelle copper solution may contain:

Copper cyanide	40 g./l.
Total sodium cyanide	50 "
Sodium carbonate	30 "
Rochelle salt	60 "
Free sodium cyanide (maximum)	4 "
pH	10.2 to 10.5

and is operated at 100° to 130°F. Alternatively, a more dilute solution can be used containing:

Copper cyanide	12-21 g./l.
Total sodium cyanide	17-26 "
Sodium carbonate	12-25 "
Rochelle salt	31-50 "
Free sodium cyanide	3- 6 "

In order to avoid dissolution of the zinc as the work enters the plating bath, electrical contact should be made with the work before it is introduced into the solution. A high strike current density, about 25 amp./sq. ft. is often applied for 2 minutes, after which a current density of 12 amp./sq. ft. is usually employed. The total plating time is usually between 5 and 7 minutes.

A tendency may be noted for the pH of the copper plating solution to rise due to drag-in from the zincate solution. This can be corrected by adding dilute tartaric acid solution. It may be noted that high pH, high free-cyanide content and high operating temperatures may all lead to blistering of the copper deposit.

The copper pyrophosphate solution has also proved satisfactory for plating on the zinc immersion coating. A typical solution contains:

Copper (as Cu)	30 g./l.
Pyrophosphate (as P_2O_7)	210 "
Ammonia (as NH_3)	3 "
pH	7.5 to 8.5

This solution should be operated at 110° to 140°F. and approximately 20 to 40 amp./sq. ft. with air agitation.

BRASS PLATING:

The standard brass plating solution can be used on the zinc immersion deposit at room temperature. A solution containing:

Copper cyanide	26.3 g./l.
Zinc cyanide	11.3 "
Sodium cyanide	45.0 "
Sodium carbonate	7.5 "

is suitable for use at 10 amp./sq. ft. at 80° to 90°F. and using 75 per cent copper—25 per cent zinc alloys. Brass plating is sometimes carried out instead of copper plating before decorative nickel-chromium plating of aluminum. The reason for this is that it has been suggested that the corrosion resistance obtained is somewhat better. On the other hand, the process is more expensive.

An important application of brass plating is its use in rubber bonding.

ZINC PLATING:

Zinc can be plated either from alkaline or acid solutions on to aluminum treated by the zinc immersion process or by the zinc strike plating bath used in the Vogt process. Unprepared aluminum can be plated in the normal cyanide zinc plating solution, but conditions are critical and the process is not recommended.

A suitable alkaline zinc plating solution for use on the zinc immersion deposit contains:

Zinc cyanide	60 g./l.
Sodium cyanide	42 "
Sodium hydroxide	79 "

and is used at 70° to 95°F., 5 to 50 amp./sq. ft. As in the case of copper plating, electrical contact should be made before the work enters the solution.

CADMIUM:

Cadmium is plated mainly for the protection of mixed assemblies of aluminum with heavy metals. For the best results a dilute strike solution is used for 1 minute at room temperature and 25 amp./sq. ft. before transferring to the main bath used at 15 to 45 amp./sq. ft. Typical solutions are given below:

	Strike Bath	*Main Bath*
Cadmium oxide	7.5 g./l.	26 g./l.
Sodium cyanide	60 "	100 "

Brighteners are sometimes added to the main bath. The plating of cadmium on a copper-nickel undercoat has been used in some protective systems of this type.

Tin, where it is electrodeposited for soldering, is usually applied over copper, and a flash nickel deposit may be interposed to prevent too-rapid diffusion of the tin into the copper. The normal stannate solution is used. Direct tin plating from the fluoborate or fluosilicate tin bath, containing 8 per cent (wt.) tin has been suggested by Perner.[22] The solution should be kept at 20°C. and a current density of 40 to 50 amp./sq. ft. may be used. Contact should be made before the current is applied.

SILVER:

Silver is plated mainly for electrical contacts and less frequently for decorative purposes. Silver should be plated for 10 seconds each in two strike baths or the second strike can be used by itself after applying a copper deposit from the copper solution given. The second method is generally more satisfactory. Typical compositions and operating conditions are as follows:

	First strike bath	*Second strike bath*
Silver cyanide	1 g./l.	5.3 g./l.
Sodium cyanide	90 "	67.5 "

Both solutions are operated at 80°F., 15 to 25 amp./sq. ft., 6 volts for 10 seconds.

After the strike treatment the following silver solution may be used at 80°F. and 5 amp./sq. ft.

Silver cyanide	30 g./l.
Potassium cyanide	55.5 "
Potassium carbonate	45 "
Free potassium cyanide	41.3 "

According to Halls,[23] copper or silver or combined copper-silver coatings should be applied in the following thicknesses:

Extreme service conditions	2 mil (average)
Intermediate conditions	1 "
Dry conditions and light arcing	0.5 "

The local minimum should be at least 50 per cent of the average thickness. In combined copper and silver coatings the copper may be approximately two thirds of the total thickness.

Silver plating over electrodeposited zinc has been suggested by a recent patent,[24] zinc plating being preceded by acid etching and immersion in 5 per cent hydrogen peroxide (120 vol.) solution.

PRECIOUS METALS:

Except for silver, precious metals are not plated direct on the zinc immersion coating but are plated on top of a heavy metal undercoat. Thus gold is normally deposited after first plating with copper (or brass) and nickel. The same procedure may be used for plating rhodium, or this metal is also sometimes plated on a silver undercoating.

According to Halls,[23] rhodium coatings, e.g., on "roller"-type contacts in radio equipment, must be applied to a greater thickness than is normal as thin deposits may tend to flake due to the "ruckling" effect on the soft base and silver undercoat.

NICKEL PLATING:

Although the use of nickel strike solutions suitable for plating direct on zinc immersion deposits is found in the literature, in practice it is more convenient to plate the nickel on a copper undercoating. The normal Watts-type or bright nickel solutions may be used under standard conditions.

Deposit thicknesses are between 0.3 and 0.5 mil nickel for non-corrosive indoor conditions and 1 to 2 mil for conditions where corrosion is encountered.

In general, the use of dull nickel deposits is often preferable, as the more brittle nickel deposits are usually more prone to develop cracks.

Both cracks and pores in the nickel deposit must be avoided rather more strictly than in plating on heavy metals, as any discontinuity in the coating is liable to promote corrosion of the anodic basis metal. For this reason, too, continuous filtration and frequent purification of the nickel plating solution, e.g., with activated carbon, are beneficial. For decorative purposes a chromium deposit is almost always applied.

CHROMIUM PLATING:

For decorative purposes 0.01 to 0.02 mil chromium is deposited on the nickel in the normal way.[25]

Chromium is plated direct on the zinc immersion deposit in hard chromium plating and also where the low-temperature chromium plating process is used for decorative purposes.

In hard chromium plating over a zinc immersion coating, a solution containing:

Chromic acid	250	g./l.
Sulphuric acid	2.5	"

has been found suitable. In practice it has often been found useful to make up two solutions, the first being kept at 65° to 70°F. After plating at the low temperature for 1 to 2 minutes, the work can be transferred to the second solution, which is kept at 105° to 110°F., where it is plated at 150 amp./sq. ft., gradually building the current density up to 300 amp./sq. ft. if required.

At low temperatures, 65° to 70°F., a slate-grey deposit is obtained from the chromic acid bath. This, however, adheres well to the zinc immersion deposit and may be polished to a high finish. Similar deposits have been obtained by the Bornhauser tetrachromate solution and the similar D-chrome process recently developed in Germany.[25,26] Little practical experience on aluminum has, however, been obtained with these processes.

Among other metals applied after zinc immersion treatment and copper plating are lead and indium, which have been used for aluminum bearing shells.[27]

There are a number of proprietary solutions based on the zincate process.

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FINISHING NICKEL AND HIGH NICKEL ALLOYS

(*Concluded from page* 55)

sives used are sharp silica, aluminum oxide, quartz, flint, and builders sand.

Compounds used for barrel finishing range from plain water to a water solution of high titer soap (hard type soaps), water and trisodium phosphate or a dilute solution of caustic soda of about 5% concentration.

The proper ratio of rolling medium to that of the work is important. Large, heavy parts require higher proportions of medium than smaller parts. A good starting ratio is 3:1. There should also be sufficient abrasive to assure a cutting action; the proportion of abrasive to work will vary with each individual job; however, this can be determined by pilot runs. Usually, as a starting point, the ratio of abrasive to work is on the order of 2 to 100 parts. Usually, the tumbling mixture has a sludge like consistency corresponding to a soft mortar. The speed of tumbling should be relatively slow; barrel speeds of about 20 rpm are satisfactory.

Pumice and oil on a walrus wheel has also been used with success in polishing nickel, Monel and Inconel. This method is used extensively in finishing sterling and silver plated ware; the same procedure being applicable in finishing the alloys under discussion. The walrus wheel is usually rotated at a considerably lower speed than that used for glued polishing wheels. The pumice is moistened with oil, lard oil, or tallow and held in a box or wooden tray under the walrus hide wheel. A handful of pumice is thrown on the work as it is held against the wheel. By using a coarse and then a fine grade of pumice, followed by coloring, a very satisfactory polish can be obtained. If there are deep marks or scratches in the work, it is best to cut down the areas around such marks on a glued wheel before starting on the coarser grade of pumice.

The author is indebted to the *International Nickel Co.* for their aid in preparing the text material and supplying the illustrations.

Porosity Detection in Plated Coatings

PORES and other flaws seriously impair the quality of industrially produced electroplated coatings, diminishing their effectiveness as protective coatings for metals. Until now it has been difficult to estimate the relative merits of electrodeposits since no method of determining the gravity of defects was available. Recently, however, the *National Bureau of Standards* has developed a non-destructive procedure for ascertaining both the size and position of pores.[1] The method involves photographing an electroplated specimen exposed to radiation.

In earlier research, a technique applicable to plated coatings that have been removed from the basis metal was developed by the Bureau.[2] However, the likelihood of stripped-coating porosity differing from adherent-coating porosity led to further investigation of the problem. The present work was carried out for the American Electroplaters' Society by *F. Ogburn* of the Bureau staff and *Margaret Hilkert* of the Society's research fellowship at the Bureau.

In determining the location and size of pores, the specimen, a flat sheet of plated metal a few thousandths of an inch thick, is placed on a photographic film with the coating against the film emulsion. The assembly is held in a cardboard cassette, and the basis-metal side of the specimen is exposed to X-rays or radiation from a radioactive material. To insure good contrast, the X-radiation used must be soft. This requirement of low-energy X-rays limits the thickness of the basis material to several thousandths of an inch, since thicker metal absorbs too much of the X-ray beam and requires too long an exposure time. Radioactive iron, nickel, or cobalt held against the plated specimen in a cassette are also adequate sources of radiation.

After a suitable exposure time, the film is removed and developed, satisfactory radiographs result from a 3- or 4-min exposure to an X-ray machine, and from a 24-hr exposure to 1μc of radioactivity. Wherever a pore existed in the coating, a black spot appears on the developed film. A fine-grain industrial X-ray film gives the most readable radiograph.

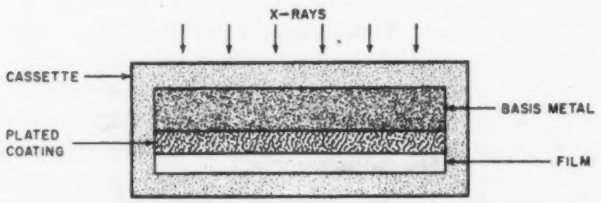

Fig. 1. Diagram illustrating the method developed at the National Bureau of Standards for investigating the porosity of electroplated coatings. The plated specimen is held against an X-ray film in a cassette with the plated coating against the emulsion of the film. The basis metal side of the assembly is exposed to X-rays or radiations from a radioactive material.

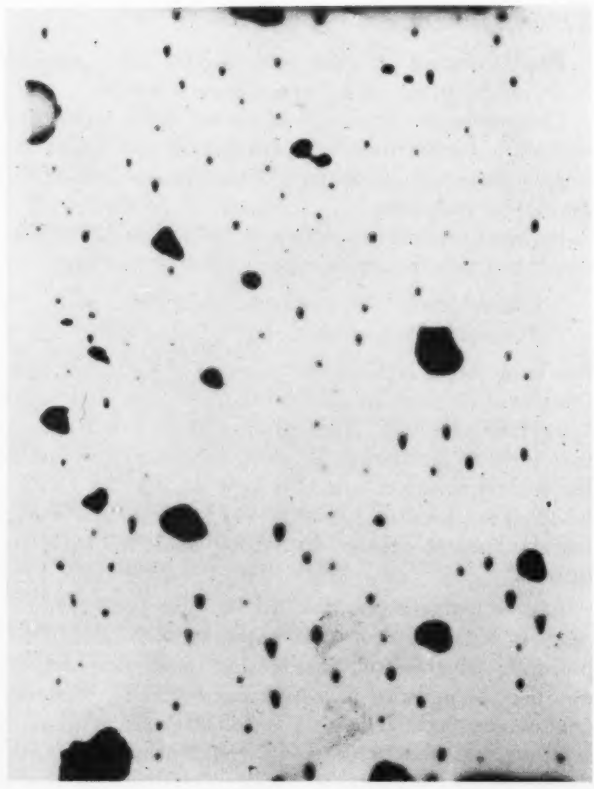

Fig. 2. Radiograph of nickel deposit on steel obtained at the Bureau. The large black areas correspond to regions marked as points of reference before plating. Most of the other spots are due to visible gas pits and the smallest dots represent pores.

This radiographic method detects pits, voids, and inclusions in the coating to the order of 0.001 in. in diameter. Discontinuities in the basis metal may also be determined by radiographing the metal before plating.

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Science for Electroplaters

22. Chemical Surface Preparation

By L. Serota

PREPARATION of a basis metal for electrodeposited coatings requires a surface that is clean; that is, free of contaminants (foreign atoms). Such a surface, a perfectly clean surface in the practices of plating, is rarely if ever attained. H. E. Linford and D. O. Feder describe a clean surface, from the point of view of the plater, as one which will not interfere with the deposition of a smooth adherent deposit. In effect, a film that is not suitable for plating operations, an objectionable film, is replaced by one which does not interfere with the process.

Oxide Coating

An example of this process is described in the report in METAL FINISHING, Feb. 1955, by Helling and Neunzig, of a development whereby aluminum may be electroplated on top of a modified anodic coating. The process entails copper plating from an acid copper solution on the M. B. V. (Modifizierter Bauer-Vogel Process) coating. This (immersion) process, employing an inhibited alkaline solution, produces a chemical conversion coating which results in a thickening of the natural oxide present on aluminum surfaces.

The presence of casting skins from untreated castings will lead to porous deposits on aluminum and magnesium-containing alloys but not in the deposition of copper on silicon alloy. The authors also report good results with copper deposits on chemical oxide coatings produced from solutions containing sodium metavanadate (Protal process). An etching operation in this plating cycle is unnecessary.

Commercial production based upon a conversion oxide coating process has not as yet been satisfactorily developed and does not produce as good results as those which can be achieved by the zinc immersion process. With this method a sodium zincate dip will produce a thin adherent deposit of zinc on the aluminum, upon which a copper strike may be applied from a Rochelle type copper bath. W. J. Travers described a procedure for plating nickel on aluminum by an anodizing process, wherein an electrolytically formed oxide film, which replaces the natural aluminum oxide, provides the base for the plating operations. The anodized film, prior to plating, is modified by means of a sodium cyanide dip. This modifying step pierces the oxide film, forming innumerable tiny openings (etching pits) through which the nickel plate is attached to the aluminum. X-ray analysis confirmed the presence of an oxide film between the aluminum base and the plated surface.

Adhesion

In general, prior to plating, any clean metal, with the possible exception of gold and a few additional noble metals, if exposed to air even momentarily after pickling, will be coated with an oxide film 10 to 15 Angstroms thick. [1 Angstrom (Å) = 0.00000001 cm.] It is evident that a clean surface, in respect to this oxide film, is one which will allow a good plate. Just when the thickness of the oxide film will begin to cause poor adhesion or covering is the basis of study, upon which a cleanliness standard relating to this film formation may be established.

Adhesion, according to E. H. Lyons Jr., may be ascribed to the porous nature of the film, which permits the plate to penetrate to the basis metal. The extent of penetration, contact areas and quality of the plated surface between such points determine the degree of adhesion. This type (penetrated film) comprises the majority of cases experienced in plating. A. W. Hothersall implies that oxides with high conductivity will permit electrodeposition on the oxide, while metal deposition for oxides of low conductivity will occur in the interstices of the film. For example, he found that copper deposited from copper sulfate solution on a stainless steel cathode, appeared at a few scattered points and then spread over the surface to produce a completed plated coat. The author also found in an investigation of adhesion that copper, when plated over nickel, gave good coverage over the nickel when the oxide film was absent, but appeared spotty or in patches where oxide films were present. C. Marie and N. Thon applied coating thicknesses — 50 Å and 300 Å — of beeswax on copper cathodes and found that copper deposits could be obtained over these surfaces, indicating that insulating layers are not necessarily uniform or continuous. Deposits would start at particular isolated points and then spread, during the electrolytic process, over the surface.

The addition of chromic acid to a nickel plating bath, it was observed, will result in bare patches appearing on the cathode when treated electrolytically. Increasing the amount (concentration) of chromic acid will, in time, prevent the entire cathode surface from being plated with nickel. The same effect is produced when the cathode is merely dipped into a chromic acid solution before nickel plating. The view held was that chromic acid reacted with the (copper) cathode forming a film which prevented the deposition of nickel. Likewise, when E. Muller and W. Stein treated one half of a gold specimen electrolytically (cathode) in a chromic acid solution and then tried to plate the entire gold electrode with silver, deposition of silver occurred only on the half which was not treated in the chromic acid bath.

In addition to oxide films, other causes of poor adhesion may be embrittlement due to codeposited hydrogen, films of grease, adsorbed colloidal matter, or pickle smut. Cathodic cleaning cycles, it is reported, will produce a film which will affect adhesion unless an acid dip, which removes the film, is included in the process.

Surface Contaminants

Contaminants of metal surfaces may be grouped under the general classification of organic and inorganic matter. This surface contamination is the result of the various finishing processes, including the effect on the basis metal composition and texture. The principle

organic impurities are oils, greases, waxes, soap, drawing, polishing, and buffing compounds. The oily soils used as temporary rust preventives are mineral oils, fatty oils, oil-in-water emulsions after drying, mill oils, and light base oils. Semi-solid soils include viscous oil or petrolatum, fats and waxes, greases, and water-in-oil emulsions.

Solid dirt particles are metal chips, abrasive grains, drawing compound pigments, and shop dirt. Abrasive grains are mainly fused aluminum oxide. Other abrasives used are silicon carbide; Turkish emery, an iron oxide; Tripoli, an amorphous silica; and emery, a natural mixture of aluminum oxide, silicon oxide and sodium oxide. The principal binders in buffing compounds are beef tallow, stearic acid, Japan wax, carnauba wax, and beeswax.

Corrosion products which may be present as surface contaminants are the oxides, scales, rust, various sulphides, sulphates, carbonates, and chlorides. These are essentially inorganic metal compounds which are formed on the metal surface. The principal contaminant is the oxide film.

Cleaner Types

Selection of the cleaning agent or method employed will be governed by the surface "dirt." A cleaner, for example, which is suitable for an oily surface, would not necessarily meet the requirements for a surface coated with oil and dirt particles or scale. The wetting power, penetration, detergency, emulsification, saponification, deflocculation, suspension, rinsibility, and other related properties are the important features to be considered in the selection of metal cleaner. A plated coating requires the removal of all traces of oil, grease and solid particles, as well as oxide and other corrosion products.

The general classification of cleaners may be represented by the following five main categories:

I. Solvents (organic)
   (a) dip
   (b) vapor degreasing
   (c) ultrasonic degreasing
II. Emulsifiable solvents
III. Emulsion and diphase cleaners
   (a) soak tank
   (b) Pressure spray washers
IV. Alkaline cleaners
V. Acid cleaners including pickling

Solvent Cleaners

Solvent cleaning is used to remove light coats of oil, grease, waxes, fats, and processing dirt. The simplest procedure for this method, hand wiping, aids in removing dirt, since the solvent will not have any effect on such contaminants. Cleaners of this type are kerosene, gasoline, naphthas, safety solvents and aromatic solvents.

A second process in use, immersion degreasing, employs two or three chambers. The sequence usually includes immersion in boiling solvent to remove heavy contamination, clean solvent rinse, cooling, and a pure vapor rinse for final cleaning and drying. The straight one-dip immersion degreasing process is also used. Boiling or warm solvent is commonly used in this process.

Where the mechanical action of the boiling solvent is insufficient to remove the insoluble material from the work or, in cases where too large a volume of solvent may be required for an immersion cycle because of the size of the work, the spray method is introduced. The warm solvent, when pressure-sprayed on the work, removes insoluble contamination mechanically. Solvent recovery by filtration and distillation is, of course, commonly practiced.

Extensive application of the solvent vapor degreasing method is found in the industrial finishing industries because it is rapid, safe in properly designed and operated equipment, noninflammable, and low in cost for removal of oils, greases, waxes, fats and soluble resins.

The introduction (about 1928) of the chlorinated hydrocarbons, because they have the highest affinity for oils and greases, led to the rapid development of this solvent cleaning method. A high boiling point solvent such as trichlorethylene, C_2HCL_3, is used because of its low specific heat, comparatively high vapor weight, and the ease with which it can be stabilized by an organic base. Organic amines are usually added as inhibitors. Such compounds have a neutralizing action on any hydrochloric acid set free by hydrolysis. This reaction may result at high temperatures when moisture is present. The low surface tension and high wetting power of trichlorethylene permit rapid solvent action on the organic products. Perchlorethylene and methylene chloride are also used.

The rate of flow of condensed vapors

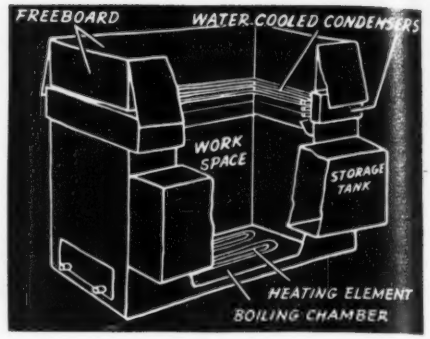

Fig. 120

however, is not rapid enough to give mechanical cleaning (to the extent of providing a physically clean metal surface) for insoluble compounds such as limes, pigments, and water soluble soaps. Immersion and spray type degreasers have, therefore, come into more common use. Vapor degreasing should be followed by some other cleaning cycle, usually alkaline cleaners. Fig. 120 represents the basic design features of a simple hand-operated vapor-type solvent degreaser.

Ultrasonic Cleaning

The application of ultrasonics in combination with conventional cleaning procedures, such as immersion and spray degreasing cycles, represents a tremendous step forward in metal cleaning procedures. This technique has shown exceptional results in the removal of minute particles of dust, dirt, chips, oil, grease, and general soils, as well as microscopic particles of soil. It is more thorough than any other process, including hand brushing. In metal cleaning, the sound waves (sonic energy) are produced by specially treated piezoelectric transducers formed of polarized polycrystalline barium titanate. This ceramic element converts electrical energy into high frequency inaudible sound waves which are conveyed, through trichlorethylene or other cleaner solutions, to the work in an immersion type degreaser. Other transducers used are magnetostriction vibrators (at frequencies below 50,000 cycles per second), and quartz crystals (at frequencies between 250,000 and 1,000,000 c.p.s.). Barium titanate operates at all frequencies. As the transducers expand and contract, owing to dimensional changes (caused by a varying magnetic field in magnetostrictive devices, or high frequency electric voltage from an electronic oscillator in the piezoelectric sonic generators), they propel sonic energy with tremen-

(*Continued on page* 70)

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Testing Passivity of Stainless Steel

Question: In your GUIDEBOOK-DIRECTORY you mention that copper sulphate mixed with an acid is the solution used for checking of passivation treatment of stainless steel. Will you please tell me what kind and how much acid should be used with the copper sulphate?

C. J. S.

Answer: Federal specification GG-I-526a calls for the following test:

Copper sulfate	4.0 g.
Sulfuric acid	10.0 ml.
Water	90.0 ml.

The stainless parts are immersed in the solution at room temperature, or a few drops are applied to the surface. After 6 minutes, the parts are wiped off. Absence of a copper deposit indicates satisfactory passivity.

Porosity in Copper-Nickel Deposits

Question: We are plating rather large assemblies of round steel tubing which have been sandblasted. After cleaning, we copper plate .00035", rinse, nickel plate, .00035" in bright nickel solution, rinse, and wipe dry. Several hours after plating, small brownish spots break out in the low C. D. areas.

We have tried using an acid dip after copper, with the same results. We've also tried putting on very thin copper and thicker nickel and still have had spotting. Electrocleaning the copper anodically did not seem to help.

We've plated some of the same pieces with nickel only with no spotting. Polished steel parts we've copper-nickel plated in the same solutions did not spot out.

Any suggestions or recommendations you may have will be greatly appreciated.

N. T. T.

Answer: The spotting out may be due to particles of sand becoming embedded in the steel during blasting, giving rise to pores, since the deposit will not cover these particles. This condition would explain why no trouble is experienced when the steel is polished. The trouble may be eliminated if steel grit is employed for blasting instead of sand, or if a hydrofluoric acid pickle is employed.

Electroless Gold

Question: Can you refer me to any sources of information on electroless or auto-catalytic plating of gold? Your help would be of great service, since the usual handbooks, etc., make no reference to this process.

N. P. B.

Answer: Electroless or auto-catalytic gold plating is produced similarly to the silver mirror process, using a gold salt and a reducing agent. A large number of solutions have been suggested in the literature and many of these will be found in the book, "Metallizing Non-Conductors," by Samuel Wein. A typical formulation is as follows:

Soln. A. Gold chloride (50-51%)	3 grams
Distilled water	80 cc.
Soln. B. Sodium carbonate	3 grams
Distilled water	80 cc.
Soln. C. Formaldehyde (40%)	5 cc.
Water	80 cc.

Equal parts of solutions A, B, and C are mixed just before application.

Nickel Dummies

Question: We dummy our nickel plating tank to remove impurities. I would like to know if the nickel accumulated on these dummies could be used again for still or barrel plating or as anodes in a purification tank. Please advise the best use for this scarce metal.

V. R.

Answer: Since the nickel deposited on the dummies contains the impurities from the solution, it would not be suitable for reuse. In any case, electrodeposited nickel will not dissolve in a nickel solution unless the chloride content is excessively high. The peelings can be forwarded to scrap converters, in exchange for virgin nickel.

Government Specifications

Question: In our line of production we are frequently called upon to plate springs to numerous different specifications, many of which are to be in accordance with government requirements. While we do eventually establish the various types of plating required, there is a considerable amount of delay in finding the proper source of information.

It has been at the suggestion of one of our sources of plating to call upon you and determine whether there is available any type of catalog which would carry a wide scope of plating specifications which we could refer to and save considerable time. We would be very much pleased to know whether you have such information available or can suggest as to where it may be obtained.

L. L. W.

Answer: We know of no single complete source of government finishing specifications. Copies of most specifications are available to contractors upon application to the appropriate agency. A fairly complete listing and digest of specifications up to 1954 was published in the May, June, and July 1954 issues of METAL FINISHING. Re-

prints of this digest are available at $1.00 per copy.

Color Buffing Nickel

Question: In using brown calico mops with lime composition in our polishing Dept. for finishing (coloring) tubular nickel plated articles, we are experiencing certain difficulties. In actual polishing operation the mops wear out very quickly, about 1″ per hour, resulting in greater consumption of lime composition. The r.p.m. of our polishing lathes are about 3,000, and the dia. of the mop we use ranges from 12″ to 14″ diam. x 1½″ thick.

The mops we use are made of new unbleached cotton cloth having 64/68 thread counts, 36″ wide, 3½ yds., weighing 1 lb. The temperature of the locality during the summer ranges from 100°F. to 110°F. We are not sure whether this temperature is responsible for the quick wearing out of the mops caused by burning due to frictional heat or whether the r.p.m. and dia. of the stitched mops have anything to do in the matter.

We shall be glad if you would kindly suggest any remedies. It is to be noted that only stitched and open folded mops are available in our place.

P. P. M.

Answer: Your 12-14″ buffs, rotating at 3,000 r.p.m. have a surface speed of 9,400-11,000 lineal feet per minute. At these high speeds, wear of the buffs will be greater than normal.

Since suitable speeds for color buffing nickel are generally 6,000-8,000 f.p.m., except for automatic machines where the speed can be slightly higher, your buffing lathes should rotate at about 2,500 r.p.m. instead of 3,000. It is suggested that some of the lathes, at 3,000 r.p.m., be used for buffs which have worn down to about 8 or 9 inches in diameter, which will provide the proper speed.

Removal of Aluminum from Acid Baths

Question: We have an anodizing plant and have a problem of disposing of approximately 3,000 gallons of phosphoric acid annually, due to aluminum build-up. In order to meet city health requirements we took several days neutralizing the solution, to be dumped into a creek, with considerable loss of production, labor and expense of the caustic used.

We solicit suggestions as to a more efficient, yet safe method of disposal.

E. C. H.

Answer: This problem can be handled successfully by removal of the aluminum from the phosphoric acid bath with an ion-exchanger. This will obviate neutralizing the acid and dumping the bath.

The ion-exchange process is in use for removal of iron from phosphoric acid pickling baths, aluminum from anodizing baths, etc., and has been found quite economical, despite the investment in equipment which is required.

You can find a description of the process in any recent edition of the METAL FINISHING GUIDEBOOK. On page 557 of the 1956 edition is a list of suppliers, under the heading "Deionizers."

Spotting Out

Question: Could you give me some of the more up-to-date methods of eliminating "spotting out" on oxidized copper finishes? This problem becomes quite serious during the summer months.

J. D. F.

Answer: Spotting out can be minimized but we know of no method which will eliminate it. Among the procedures employed are baking at about 225 deg. F. prior to lacquering, mild acid and chromate dips such as 2 oz./gal. chromic acid, chelating agents, and wetting agents. A number of proprietary materials based on the last three methods are available from various suppliers whose ads will be found in any recent issue of METAL FINISHING.

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ABSTRACTS

Reduction of Nickel by Hypophosphite

A. A. Nikiforowa: *Shurnal fisistscheskoi* (Journal Physical Chemistry —Russia). Vol. 28, No. 5, p. 883.

Nickel separates out from solutions of its salts reacted with hypophosphite on nickel, iron and aluminum, but on copper and brass only if these are in contact with a less-noble metal. Actually, the reduction process is only catalyzed by metallic nickel for, on iron and aluminum, an electrochemical nickel coating separates out first.

It was found that the best conditions for the formation of a compact, bright coating are: concentration of the nickel chloride=30 g./l.; sodium hypophosphite=10 g./l.; sodium glycolate=10 g./l.; pH=4.5 to 5; and working temperature=90-95°C. The deposition rate is 10 microns per hour. The hypophosphite is oxidized to phosphite. There is a simultaneous separation of hydrogen which is proportional to the nickel separation. The nickel coating has a phosphorus content of 10%. The coatings are very finely porous and adhere firmly to the basis metal. They have a lower ductility but a higher wear resistance and better corrosion-protective characteristics than electroplated nickel coatings.

Wetting Agents in Metal Surface Treatments and Finishing

R. Springer: *Metallwarenindustrie und Galvanotechnik*. Vol. 45, No. 2, p. 51.

The author discusses the nature of wetting agents and the significance of surface tension. With the addition of surface-active materials such as wetting agents, there is an optimum concentration, after which the surface tension is not lowered to any appreciable extent. This concentration lies generally in the range of 0.1-0.3%. Regarding the action of wetting agents, distilled water has a surface tension of 73 dynes/cm. A good wetting agent can reduce this surface tension to a value of 30-32 dynes/cm. Pore formation ceases with a surface tension below 60 dynes/cm. All the remaining advantages of wetting agents, are obtained only with a surface tension below 38 dynes/cm.

Characteristics required of a suitable wetting agent applicable to plating baths are ability to withstand the temperatures and pH values common to various plating schedules and, in addition, they must evince a certain stability against oxidation at the anode and reduction at the cathode. When testing, wetting agents should be investigated as to whether they are stable to acids and alkalies, as well as to hard water and heavy metal ions, and whether they possess a sufficient solubility, i.e., a solubility in any particular solution used in the treatment concerned; this may be pickling, cleaning, plating, etc. Apart from general characteristics, wetting agents have specialized advantages in plating practice; for example, the spray mist from chromium baths can be reduced with wetting agents and drag-out is also reduced.

Bright Plating Baths

W. Briese: *Metallwarenindustrie und Galvanotechnik*. Vol. 45, No. 2, p. 60.

A series of tests were conducted by the author for the purpose of showing that the corrosion-protective value of a combined copper-nickel-chromium coating is less, if the three coatings are applied directly on one another, without any intermediate working.

Zinc die casting were used for the tests; there were 6 test groups each with 20 test parts. The parts were handled as follows (1) deburring; (2) polishing; (3) degreasing with trichlorethylene; (4) hot air treatment at 160°C. for 15 minutes; (5) cleaning in a potassium cyanide bath; (6) rinsing; (7) activating in sodium cyanide solution; (8) rinsing. Subsequently the parts were given a 15 micron thick plate in a potassium cyanide bright copper bath, some of the test groups being intermediate polished or scratch-brushed with brass wire brushes and then cleaned, activated in 1:1 hydrochloric acid, rinsed, and then given a 10 micron coating in a bright nickel bath. After the nickel plate they were rinsed and some of the test groups were dried, given an intermediate polish and again cleaned, activated in 1:10 sulfuric acid, rinsed and bright chromium plated. All the test groups were hung for 4 months in the open air and, after this, judged according to appearance, number of blisters and cracks, etc.

It was found that the best corrosion-resistant results were obtained with copper-nickel-chromium coatings with the following method of working: A nickel plate was applied directly after the copper plate, the nickel plate given a very light buffing and then chromium plated. This did not imply that the bright baths were of no use; if mat baths had been used, a heavy polish would have had to be given to the nickel. It was found also that the corrosion resistance was better in the respective tests when the copper plate had been scratch-brushed than when the copper coating was buffed. It was considered that this was because too much copper is taken off in the buffing.

Zinc Plating for Rust Protection

R. Koehler: *Metallwarenindustrie und Galvanotechnik*. Vol. 45, No. 2, p. 67.

For corrosion protection, zinc is generally plated on steel to a thickness of 0.02 mm. (0.0008"). For many purposes, a thickness of plate of 0.01 mm. will suffice; for very corrosive atmospheres, a thicker coating may be applied. The effectiveness of a coating of this nature for corrosion protection may be judged from the fact that tests which were conducted on steel roof sheeting over a period of 27 years exposure to a Middle European climate showed that the coating had reduced in thickness by about 0.006 mm. The actual thickness applied will need to be judged by individual cases and the service conditions. After plating, the zinc coating should be able to withstand repeated bending without parting from the basis metal.

In addition to sheet, steel wire is also coated to a considerable extent with zinc. To test the zinc plated wire for corrosion resistance, it is immersed in concentrated copper sulfate solution at 20°C. If the corrosion behavior is satisfactory, no copper should be found adhering firmly to the wire surface. When plating steel with zinc, if recessed parts are being treated, consideration should be given to the fact that auxiliary anodes may be needed to ensure a uniform deposit over an irregularly shaped surface or in recesses.

Recess Plating and Throwing Power in Plating Baths

O. P. Kraemer: *Metallwarenindustrie und Galvanotechnik.* Vol. 45, No. 2, p. 70.

Throwing power is very variable with different electrolytes, as is known from practical experience. When considering the throwing power of electrolytes, the following points can be made:

1. The primary current distribution. This is determined by the size of the electrodes and their distance from one another. When measuring the throwing power in a test cell, the size, electrolyte volume, electrode size, and temperature must be kept constant. If the cathode is not polarized, then the current distribution is uniform and is not dependent on the composition of the electrolyte.

2. The secondary current distribution. This is always dependent on the electrolyte composition, and is more or less non-uniform.

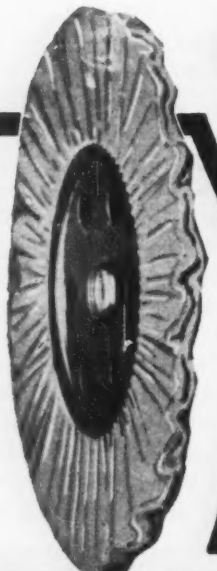
The metal distribution is defined by the secondary current distribution and the cathodic current efficiency. The throwing power is then obtained as the difference between the metal distribution and the primary current distribution.

Hydrogen in Metal Plating Practice

H. Grube: *Metallwarenindustrie und Galvanotechnik.* Vol. 45, No. 10, p. 477.

Hydrogen formed at the cathode during the plating process can form compounds with the cathode or dissolve in the metal. The hydrogen compounds of metals are solid and gaseous. The gaseous compounds need attention in plating practice; they are usually very poisonous. Arsenic and antimony form compounds of this type and, to a smaller extent, lead, tin, and bismuth, and this should be watched when using these baths. These hydrogen compounds (hydrides) can also be formed during pickling (from pickling acids containing arsenic). Pickling inhibitors tend to reduce this formation. Solid solutions of hydrogen in arsenic or antimony are not known; also cadmium, zinc, silver, gold absorb very little hydrogen. Iron, nickel, and copper absorb greater quantities.

The absorbed hydrogen leads to embrittlement of the deposit. In general, nickel does not absorb as much hydrogen as iron. The first coating of nickel will contain more hydrogen than the subsequent layers of the deposit. This variable solubility causes serious stress conditions in the nickel and can lead to cracking or flaking. Iron in the nickel bath will accentuate this trouble; the first plated layers will be richer in iron, which will act the same as hydrogen in promoting stress. The stresses in a thin-walled nickel-plated part, caused by absorbed hydrogen, can be so great as to bend the walls. Low temperature, high current density, low acidity, low nickel content aggrevate this trouble. Hydrogen generation at the cathode should be kept down when brass plating iron or steel. In chromium plating, since hydrogen generation cannot be avoided, a compro-



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COMPOUNDS MADE IN BAR, SPRAY OR PASTE

mise must be made by arranging the most favorable bath conditions. Zinc plating steel in cyanide baths can lead to trouble if care is not taken.

High-Speed Bright Copper Plating Baths

W. Roggendorf: *Metallwaren Industrie und Galvanotechnik.* Vol. 45, No. 10, p. 479.

The author deals with the periodic reverse current bright copper bath, and compares this procedure with the bright copper bath working in the normal manner. It is considered that the modern high speed bright copper baths recently developed have many advantages to offer over the p.r. process. High current densities can be applied with a short plating time and give bright copper plates as with a bright nickel bath. These are hot baths with a high copper content of 60 to 85 g./l., which give the best brightening effect at temperatures of 65 to 80° C. A cathode movement of 4-6 meters/min. is required with this type of bath, also continuous filtration. With current densities of 2.5 to 5 amp./sq. dm. there is obtained a plating speed of 0.75 to 1.5 microns of copper per minute. The bath is easily maintained in operation. When the brightening action on the plate falls off, brightener addition is made; either daily, or several times a week according to requirements, depending on the throughput addition is made of regenerating solutions. Filtration is best conducted after bath shutdown, and an additional filtration with activated carbon at time intervals is very useful. These baths are best worked as full-automatic units since, with this, the best use is made of the high current densities possible, and high outputs are obtained — 10 minutes for a 15 micron thick bright copper plate.

Operating Experience With a Hot Copper Plating Bath

Metallwaren-industrie und Galvanotechnik. Vol. 45, No. 10, p. 481.

A hot copper bath is discussed in a medium sized plating works with a capacity of 3,000 liters (about 700 gallons). The bath was operated with movement of the ware, temperature 70° to 80°C., at 1-3 volts and 2 amp./sq. dm., current efficiency 100%. The anode surface was 1½ times that of the cathode. The plated ware came bright from the bath with a silky sheen. No electrolyte correction was required with the exception of make-up of drag-out loss and evaporated water and replacement daily of the used cyanide. A daily output of about 5,000 sq. dm. of ware surface area was plated for a period of 9 months, without interruption. Trouble started when the motor driving the cathode agitation equipment failed and a new motor was used. Pore-spotted ware was produced and no measure taken was found to cure the trouble. When the original motor was put back on the drive, the trouble stopped. It was found that the bath working was very sensitive to the cathode displacement movement and, unless this was kept at the correct figure, faulty ware was produced;

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when the trouble was encountered, scrap ware rose to as high as 80%.

SCIENCE FOR ELECTROPLATERS

(*Concluded from page* 64)

dous force in liquid layers, at certain frequencies and intensities at which the transducers are designed to operate. Pressure fluctuations of considerable magnitude are produced, so that the liquid is pulled apart for an instant and hollow bubbles result, which then collapse violently. This process, repeated over and over again, is called cavitation and is capable of subjecting the metal parts to an excellent scrubbing. Transducers are shaped to focus the sound waves on the work. Fig. 121 shows schematically a unit with built-in sonic cleaning.

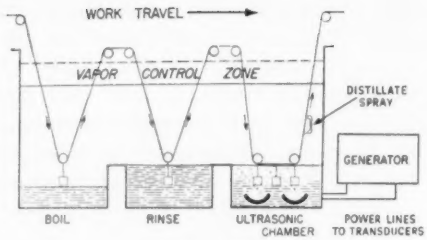

Fig. 121

Emulsion Cleaning

An emulsion consists, essentially, of droplets of one liquid dispersed in a large quantity of a second liquid, such as small amounts of oil dispersed in a large amount of water. Stability is due to the electrical potential on the colloidal droplets. In emulsions of greater concentration, an additional (protective) agent, called an emulsifier, is added. This component forms a film around the droplets at the oil-water interface, thus preventing coalescence.

The principle is utilized in cleaning cycles by bringing a soil in contact with both an organic solvent and a water solution of a surface active agent (including soap as potassium oleate) which serves as the stabilizer. In this manner, both water-soluble and solvent-soluble soils may be dissolved. In diphase cleaning the solvent floats as a separate layer on the top of the water solution. This method permits more intimate contact between the organic solvent and the soil than that attained in the emulsion cycle. The latter process, however, allows increased contact of soil with the water solution, hence greater detergent action. These methods are more effective when used with spray equipment instead of soak tanks.

The cheaper hydrocarbons, kerosene and naphtha, are used as solvents. In emulsion cleaning these solvents are so well dispersed in water that a moderate flash point solvent may be safely used up to a temperature of 180°F. With diphase cleaning, the flash point of the solvent presents a hazard and has limited the usefulness of this method. Emulsifiable solvents are very effective in the removal of heavy films of oils and waxes, buffing compounds, dried-on pigments, heavy greases, and rust preventatives. Since both types of cleaners leave a thin oily residue, emulsion or diphase cleaning must be followed by an alkaline (electrolytic or immersion) cleaning operation to remove these residues. Emulsion cleaners are sometimes improved when used in conjunction with alkalies, especially in pressure spray equipment.

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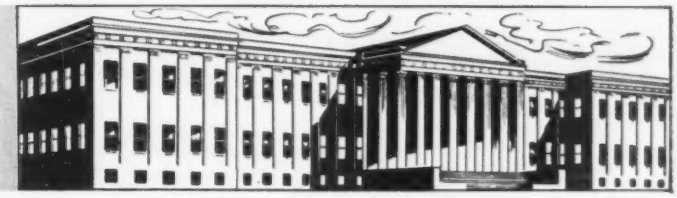
COMPOUNDS MADE IN BAR, SPRAY OR PASTE

Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Volatile Corrosion Inhibitor

U. S. Patent 2,756,120. *July* 24, 1956. *R. L. Lothringer, assignor to Sinclair Refining Co.*

A method of inhibiting corrosion of enclosed ferrous metal surfaces which comprises maintaining an atmosphere containing vaporized ammonium naphthenate in contact with the metal surfaces in amounts such that at least 0.1 pound of ammonium naphthenate is present for each million cubic feet of enclosed space.

Rustproofing Compositions

U. S. Patent 2,756,156. *July* 24, 1956. *M. J. Hiler, assignor to The Commonwealth Engineering Co. of Ohio.*

An improved hydrocarbon oil composition comprising a major amount of a hydrocarbon oil and a minor amount of an ester of a saturated fatty acid of from 8 to 18 carbon atoms with a substance selected from the group consisting of dextran and initially low-substituted dextrans in which the substituent groups initially present are groups other than those derived from said saturated fatty acids and present in an average proportion not greater than about 1.0 such group per anhydroglucopyranosidic unit, the amount of the dextran or initially low-substituted dextran ester being sufficient to impart corrosion-resistant properties to the composition.

Continuous Electroforming of Tubes

U. S. Patent 2,756,205. *July* 24, 1956. *G. Rosenqvist.*

Apparatus for sealing leakage of electrolyte around a rotating cathode protruding through an orifice in the wall of a tank for electrodeposition of metal, comprising the combination of a seal element extending radially from the cathode to occupy the free area of the orifice around the cathode and obstruct the orifice against substantial leakage of electrolyte, the margins of the tank wall surrounding the orifice being formed as annular protuberances engaging the element in an axial direction, the element being adequately secured to the cathode to rotate therewith and being held against axial movement with the cathode in either direction by abutment against said protuberances on opposite sides thereof, and fluid pressure means expanding the seal element axially substantially to equalize the pressure of the element against said opposite protuberances.

Bright Nickel Bath

U. S. Patent 2,757,133. *July* 31, 1956. *W. J. Shenk, Jr., assignor to The Harshaw Chemical Co.*

An acid, nickel electroplating solution comprising a nickel electrolyte of the class consisting of nickel sulfate, nickel chloride and mixtures thereof, together with an addition agent of the formula R—SO_2NHSO_2—R′, where R is an aromatic radical having not more than ten nuclear carbon atoms and R′ is selected from the class consisting of aromatic radicals having not more than ten nuclear carbon atoms, aliphatic radicals having from 1 to 18 carbon atoms, including at least one unsaturated carbon to carbon bond, aryl substituted aliphatic radicals having 7 to 11 carbon atoms, radicals of the formula R″—SO_2NHSO_2R‴, radicals of the formula RR″—SO_2NHSO_2—R‴, radicals of the formula ROR″—SO_2NHSO_2—R‴ and radicals of the formula RCH_2R'' — SO_2NHSO_2 — R‴, R, R″ and R‴ occurring in said last four radicals, indicating aromatic radicals having not more than ten nuclear carbon atoms, said addition agent being present to the extent of from 0.1 to 6 grams per liter.

Bright Zinc Bath

U. S. Patent 2,757,134. *July* 31, 1956. *D. R. Turner, assignor to Westinghouse Electric Corp.*

In an alkaline cyanide zinc electroplating electrolyte for depositing substantially pure zinc which comprises as its essential ingredients zinc cyanide in an amount of about 8 to 10 ounces per gallon, sodium cyanide, and caustic soda, silver as a brightening agent admixed in the electrolyte in an amount of from 0.0005 to 0.5 ounce per gallon of electrolyte.

Electropolishing

U. S. Patent 2,757,136. *July* 31, 1956. *J. Heyes.*

In a method for the electrolytical polishing of metal articles by means of an inflammable liquid electrolyte having a low ignition point, said articles being placed in a tank containing said electrolyte, the steps of preventing the inflammation of the heated electrolyte by introducing water through a tube into the bottom portion of the same, automatically controlling the supply of said water upon the establishment of a certain predetermined temperature in the electrolyte and simultaneously removing the diluted electrolyte from said tank.

Cleaning of Small Articles

U. S. Patent 2,756,168. *July* 24, 1956. *D. M. Ruggles, assignor to Bell Telephone Laboratories, Inc.*

The method of cleaning small fragile articles comprising placing the articles in a container, spraying a cleaning fluid against a surface within said container distant from the articles with sufficient force to break up the spray into a fine mist, and allowing said mist to condense on the articles.

Belt Polisher

U. S. Patent 2,757,490. *Aug.* 7, 1956. *H. Whitesell and M. Matheu.*

The combination with a cylindrical surface drive wheel and means to journal said wheel for rotation on its axis and means to drive said wheel, and an abrasive surface belt travelling on the cylindrical surface of said drive wheel and supported by said cylindrical surface, of means to maintain said belt

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element in driving engagement with said drive wheel cylindrical surface and to control the location of running engagement of said belt element with said surface, comprising a crowned surface idler wheel located in proximity to but separated from the drive wheel and with the crowned surface of said idler wheel in belt running alignment with the drive wheel, the belt element travelling directly between the idler wheel crowned surface and over the drive wheel cylindrical surface during belt running engagement with the two wheels, means to journal the idler wheel, and to control tracking of the belt on the drive wheel, said means comprising a rod, a journal mounting the wheel on the rod at a position fixed longitudinally of the rod, support for the rod at one side of the wheel journal mounting, a fixed pivotal mounting for said rod support, the axis of said pivotal mounting being substantially parallel to the belt runs approaching and leaving the idler wheel and intersecting the projected axis of idler wheel rotation, the rod being endwise movable through the rod support, means to move the rod longitudinally through the rod support to thereby laterally adjust the location of the crown of the wheel, and means to cause the rod and the rod support to tilt about said fixed pivotal mounting during such endwise movement of the rod, to thereby rock the plane which includes the apex of the crown of the idler wheel in comparison to any plane which is normal to the axis of rotation of the drive wheel.

Stripping Silver

U. S. Patent 2,758,074. *Aug.* 7, 1956. *O. D. Black and R. M. Walsh, assignors to Radio Corp. of America.*

A method of removing a film of silver from a copper base substrate comprising anodically electrolyzing said film in an aqueous solution consisting esentially of 50 to 500 gm. per liter sodium thiosulfate.

Bright Acid Copper

U. S. Patent 2,758,076. *Aug.* 7, 1956. *F. Passal, assignor to Metal & Thermit Corp.*

An aqueous acid bath solution for bright copper plating containing copper sulfate as the source of the copper, sulfuric acid, about 0.0005 to about 0.03 g./l. of a first compound selected from the class consisting of 2-mercapto-benzimidazole and derivatives of 2-mercapto-benzimidazole having in the 6-membered ring thereof a radical selected from the class consisting of amino and substituted amino radicals, and about 0.0005 to about 0.03 g./l. of a second compound selected from the class consisting of thiourea and acyl derivatives of thiourea.

Electroforming

U. S. Patent 2,758,961. *Aug.* 14, 1956. *L. K. Kosowsky, assignor to Columbia Records, Inc.*

The method of producing negative matrices consisting preponderantly of iron which comprises immersing a cathodic mother in an aquous electrolyte of ferrous chloride and calcium chloride and under reducing conditions at a pH of less than 1.5 and at a uniform temperature, maintaining the mother stationary at a relatively low current density about 10 amperes per square foot until a layer of iron about .0005 inch thick has been deposited, and then effecting a back and forth movement of the mother and increasing the current density to deposit the major part of the iron.

Rack Type Burnishing Barrel

U. S. Patent 2,758,362. *Aug.* 14, 1956. *C. W. Benedict, assignor to Roll-Brite Corp.*

In apparatus for burnishing articles, a barrel to contain burnishing materi-

als and mounted to rotate about a longitudinal axis, said barrel having one open end and a removable cover therefor, mounting means for an article-supporting rack in said barrel comprising an elongated shaft mounted on the other end of the barrel and extending along the barrel coaxially therewith, an article-supporting rack including a central body section having an opening therethrough of a cross section approximately corresponding in size and shape to the cross section of said shaft supported by said shaft and telescopically slidable onto and off the shaft through said open end of the barrel, and brackets on said body section for attaching the articles to the rack.

Hot Galvanizing

U. S. Patent 2,758,944. *Aug.* 14, 1956. *W. S. Pearson, assignor to C. C. Corp.*

In a method of recovering zinc spatter from freshly galvanized pipe sections as they come from the zinc pot, the steps of blowing excess zinc from successive sections into an enclosed spatter chamber having predetermined atmospheric conditions therein, allowing the zinc to solidify in the chamber, collecting the particles of zinc spatter within the chamber progressively as the solidified spatter is formed, and before the spatter has been exposed for any appreciable length of time to the influences of the atmosphere within the chamber, compacting the particles into an aggregative substantially void-free mass, said compacting continuing progressively as successive pipe sections are blown free of excess zinc until a block of predetermined size has been formed for convenient handling and return for remelting in the zinc pot.

Phosphate Conversion Coatings

U. S. Patent 2,758,949. *Aug.* 14, 1956. *H. Ley, W. Stenger, W. Werner and K. Lampatzer, assignors to Parker Rust Proof Co.*

A method for forming a coating on the surface of a metal selected from the group consisting of iron, steel, zinc and aluminum which comprises the step of contacting the surface with a solution consisting essentially of an aqueous acidic solution of an alkali metal phosphate and a metallic ion sequestering agent selected from the group consisting of polyphosphates in an amount of about 1 to about 20 grams/liter, and acetic amino acids and the alkali metal salts thereof in an amount equivalent to about 0.77 to about 7.7 grams/liter of ethylene diamine tetra acetic acid, said solution having a pH of between 3 and 6.

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Electroforming

U. S. Patent 2,758,950. *Aug.* 14, 1956. *J. F. Lakner, assignor to the United States of America*

A process for producing a carbon steel article of manufacture comprising forming a body of a refractory carbide material selected from the group consisting of titanium carbide, tungsten carbide, zirconium carbide, boron carbide, silicon carbide and chromium carbide said body having an outside surface conforming with the inside configuration of said article to be produced; electroforming with iron upon said refractory carbide body to form an iron shell; carburizing said formed iron shell while in place on said refractory carbide body; heat treating said carburized shell; and removing said carburized heat treated shell from said refractory carbide body.

Tin Plating Steel Strip

U. S. Patent 2,758,075. *Aug.* 7 1956. *D. A. Swalheim, assignor to E. I. du Pont de Nemours & Co.*

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of steel strip to make tin plate, the steps comprising passing steel strip through a stannous bath while electrodepositing tin thereupon and incidentally effecting agitation and aeration of the bath so that it contains dissolved and dispersed gases, the stannous bath being an aqueous bath comprising from about 37.5 to 150 grams per liter of an alkali fluoride, and from about 37.5 to 150 grams per liter of stannous chloride and satisfying the equation:

$$pH = \frac{k(\text{mols MF})}{\text{mols } SnCl_2}$$

wherein the following conditions are simultaneously true; the pH is equal to about 2 to 4, k has a value of about 0.3 to 0.7, MF is alkali fluoride, and the mole ratio

$$\frac{MF}{SnCl_2}$$

is about from 3 to 12, the static solution potential of tin in the bath being equal in volts to from

—0.055 pH—0.265 to —0.055 pH—0.370

dispersing nitrogen which contains less than 5% of oxygen in the bath to reduce the oxygen content of gases dissolved and dispersed in the bath to below 10 per cent thus to reduce sludge formation and to maintain an increased cathode efficiency.

Plating with Auxiliary Anodes

U. S. Patent 2,758,962. *Aug.* 14, 1956. *H. C. Luechauer, assignor to General Motors Corp.*

In a method for obtaining a substantially uniform electroplate on the concave surfaces of a plurality of similarly shaped, semi-cylindrical objects, each of which includes an insulating member shielding the convex side thereof, the steps comprising; staggering the objects in rows on opposite sides of a central plane with their concave surfaces facing one another, overlapping portions only of the objects in one of said rows with the objects in another of said rows so that the closest spaced overlapped portions of each pair of opposed objects are spaced from one another and are disposed on opposite sides of said central plane from the remainder of the respective objects for shielding the concave surfaces of the objects, electrically connecting all of said objects to one terminal of a power source, immersing said electrically connected objects in suitable electrolyte, providing a pair of anodes connected to the other terminal of said power source, immersing said anodes in said electrolyte in spaced relation to one another and each facing the convex sides of the objects in one of said rows of objects, whereby a uniform thickness of electroplate is deposited on the concave surfaces of said objects.

Copper Coating Silver Mirrors

U. S. Patent 2,759,845. *Aug.* 21, 1956. *H. H. Hilemn, assignor to Metropolitan Mirror and Glass Co., Inc.*

A continuous method of producing silvered mirrors, which comprises continuously moving plates of glass, continuously applying to one side of each plate a silver salt and a reducing agent to form a silver surface on said plate, continuously applying to said silver surface while it is still wet a spray of aqueous copper sulfate solution having a pH of from 0.8 to 1.2, said solution having a concentration of approximately 0.1% to 0.2% copper sulfate, and a suspension of copper-coated finely divided iron particles, said particles having a size within the range of from 0.1 to 0.005 mm., said suspension having a concentration of about 2% to about 4% of said copper-coated iron particles and also containing about 0.0002% hydrazine, about 0.001% formaldehyde and about 0.001% triethanolamine,

the said suspension and said solution of copper sulfate being sprayed in approximately equal amounts and the resultant mixture deposited on the said silver surface thus forming a layer of copper on said silver surfaces.

Gas Plating

U. S. Patent 2,759,848. *Aug.* 21, 1956. *M. V. Sullivan, assignor to Bell Telephone Laboratories, Inc.*

The method of depositing metallic films, which method comprises thermally decomposing at least one metal carbonyl at the surface of a body in the presence of a catalyst for the decomposition, said catalyst being a member of the group consisting of silicon tetrachloride and titanium tetrachloride.

Hot Dipping Process

U. S. Patent 2,759,850. *Aug.* 21, 1956. *E. J. Knopf, assignor to Wheeling Steel Corp.*

In the coating of sheets with molten metal by immersing the sheets in a bath of molten metal and delivering the sheets successively edgewise upwardly out of the bath, substantially entirely inhibiting exposure of molten metal of the bath at the surface of the bath where the sheets are delivered out of the bath between the time when the trailing edge of one sheet passes out of the bath and the time when the leading edge of the succeeding sheet passes out of the bath and also exposing molten metal of the bath at the surface of the bath where the sheets are delivered out of the bath during the time while a sheet is passing out of the bath whereby to form on the sheet a coating of substantially uniform thickness along the sheet in the direction of delivery.

Conversion Coating

U. S. Patent 2,760,891. *Aug.* 28, 1956. *V. R. Nichols, assignor to Borg-Warner Corp.*

The method of providing a protective coating on brass, copper, zinc, steel, aluminum and cadmium surfaces of metal parts which comprises immersing the parts in a protective coating solution consisting per liter of water of 150 to 600 grams chromic oxide, 85 to 170 grams of 66° Baumé sulphuric acid, 43.4 to 130.2 grams of nitric acid(HNO_3), and not more than 22.5 grams of nickel sulphate hexahydrate ($NiSO_4 \cdot 6H_2O$) in an amount sufficient to substantially retard eating action of the solution on said metal parts.

Electrolytic Pickling Apparatus

U. S. Patent 2,759,888. *Aug.* 21, 1956. *G. H. Rendel, assignor to U. S. Steel Corp.*

Electrolytic pickling apparatus for strip comprising means for containing an electrolyte, only two conductor rolls, one of said rolls being an entry conductor roll over which the strip passes before passing into said electrolyte, the other of said rolls being an exit conductor roll over which the strip passes after passing through said electrolyte, a plurality of electrodes arranged in tandem in said means along the path of travel of said trip, a plurality of generators, means for individually varying the quantity and direction of current generated by each generator, current leads connecting a first terminal of the first of said generators to the entry conductor roll, current leads connecting the second terminal of the first of said generators to the first of said electrodes, current leads connecting a first terminal of the last of said generators to the exit conductor roll, current leads connecting the second terminal of the last of said generators to the last of said electrodes, and a common connection between the first terminals of said generators.

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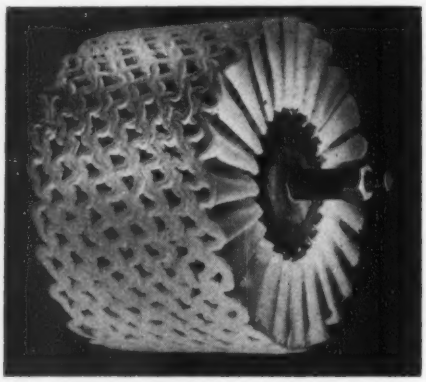
Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES

Spoke Buff

Guaranteed Buff Co., Inc., Dept. MF, 20 Vandam St., New York 13, N. Y.

The above firm claims that its new 45° spoke buff cuts faster and smoother, with less pressure, leaving no buffing streaks. The buff is held by



flanges below the point of air intake, thus allowing more air to enter through the center; as a result this cooler buff lasts longer and never overheats, it is claimed.

Since it operates many degrees cooler, the buff can be used at higher speeds and greater pressure, resulting in higher production per hour, according to the manufacturer.

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Coloring Copper and Its Alloys

Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.

A new process called Enthocolor 220 has been developed for producing brown and shiny blue-black coatings on copper and copper base alloys. The coatings produced are oxides. Uniform brown colors can be produced on copper and on almost all copper alloys. Blue-black and brown colors are produced on brasses containing 20% or more of zinc. Due to the fact that the finishes formed are oxides, no subsequent crystal spotting occurs, such as is experienced with sulphide finishes. The adhesion of the finishes is excellent, it is claimed. Work can be severely deformed without causing the coating to flake. Attractive two-tone effects can be obtained by relieving portions of the oxide coating.

The compound is supplied as an alkaline salt mixture and is used at 180°F. to 225°F. Parts to be colored are given the usual preparatory treatments and are then immersed in the coloring solution for periods of 1 to 15 minutes. The brown shades are stated to be very attractive and can be used in place of brown lacquers or enamels as well as sulphide finishes. The finishes are also excellent bases for subsequent painting and the process can be used as preparatory procedure for blackening with Ebonol "C".

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As with its parent product, Vythene, the new material is approximately 20 times less toxic than carbon tetrachloride and has no flash point. In addition, the product is highly stabilized to all metals including aluminum and can be successfully reclaimed by distillation.

The solvent is now available in drum quantities directly from the manufacturer and its distributors.

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Vacuum Metalizing Units

F. J. Stokes Corp., Dept. MF, 5500 Tabor Rd., Philadelphia 20, Pa.

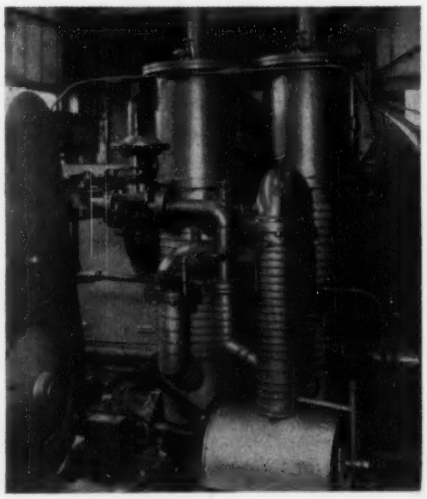
A complete redesign of the vacuum pumping system of its Model 427 72-inch large-scale production vacuum metalizing unit has been carried out by the above manufacturer. The new design achieves faster evacuation of the chamber and hence permits shorter metallizing cycles and greater productivity. Simplification of the pumping system through the use of fewer but larger capacity diffusion pumps eliminates certain vacuum valves and connections, reduces piping, and improves overall production efficiency.

The redesigned unit has two 16-in. "Ring-Jet" diffusion pumps of greater overall capacity than the three 14-in. pumps in the former design. The 6-in. "Ring-Jet" booster pump which backs up the diffusion pumps has significantly higher throughput than the booster previously used.

As a result, pump-down to 0.5 microns (normal "flashing" pressure) has been reduced to six minutes or less and the pumping system is better able to handle unusual operating conditions such as heavy outgassing from the work or from contaminated chamber walls.

Other details which made the 72-inch unit a pace-setter for the industry have been retained in the new Model 427. In particular, the high degree of automation in the control system has been continued with sequenced push-button operation of the unit. Interlocked control circuits guarantee foolproof performance even with ordinary skilled labor.

Solenoid-controlled air-operated



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CADALUME PLATING PROCESS

Cadmium Plating Costs Cut With CADALUME.
This new H-VW-M formula:—

- Eliminates most bright dipping
- Increases brightness range 10%
- Improves distribution in all tanks
- Speeds plating time by 10%

CADALUME simplifies the cadmium plating process—makes it profitable for job shops and plating plants.

LONGER LIFE	80,000 AMP HOURS A GALLON
LOWER COSTS	10% FASTER: 10% BRIGHTER
BETTER DISTRIBUTION	CADALUME STAYS STABLE

Long-life plus economy is the keynote of CADALUME. Once a new bath is made ready with CADALUME MAKE-UP BRIGHTENER—or an existing bath converted —*all* plating is done with single-solution, stable CADALUME BRIGHTENER. Keep your cadmium plating costs low. Get all the facts. Write for the New Cadalume Technical Manual—today. **Hanson-Van Winkle-Munning Company, Matawan, New Jersey. Offices in principal cities.**

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PLATEMANSHIP —Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

Hanson-Van Winkle-Munning Company, Matawan, New Jersey. Offices in principal cities.

poppet valves are installed in the vacuum manifold. These valves are all remotely operated from the control console located at the front of the unit.

71/Circle on Readers' Service Card

Line-Operated pH Meter

Photovolt Corp., Dept. MF, 95 Madison Ave., New York 16, N. Y.

The Model 85 line-operated pH meter was designed to meet the growing demand for inexpensive pH meters of the simplest possible construction, to permit their use by operators with limited training. Designed to meet this demand, while still having an accuracy of 0.1 pH unit, the new model is said to be simple in operation and maintenance; fast, rugged and dependable in service.

It can be furnished either with individual glass and calomel electrodes or with a "probe" electrode, i.e., a combination of glass and calomel electrodes.

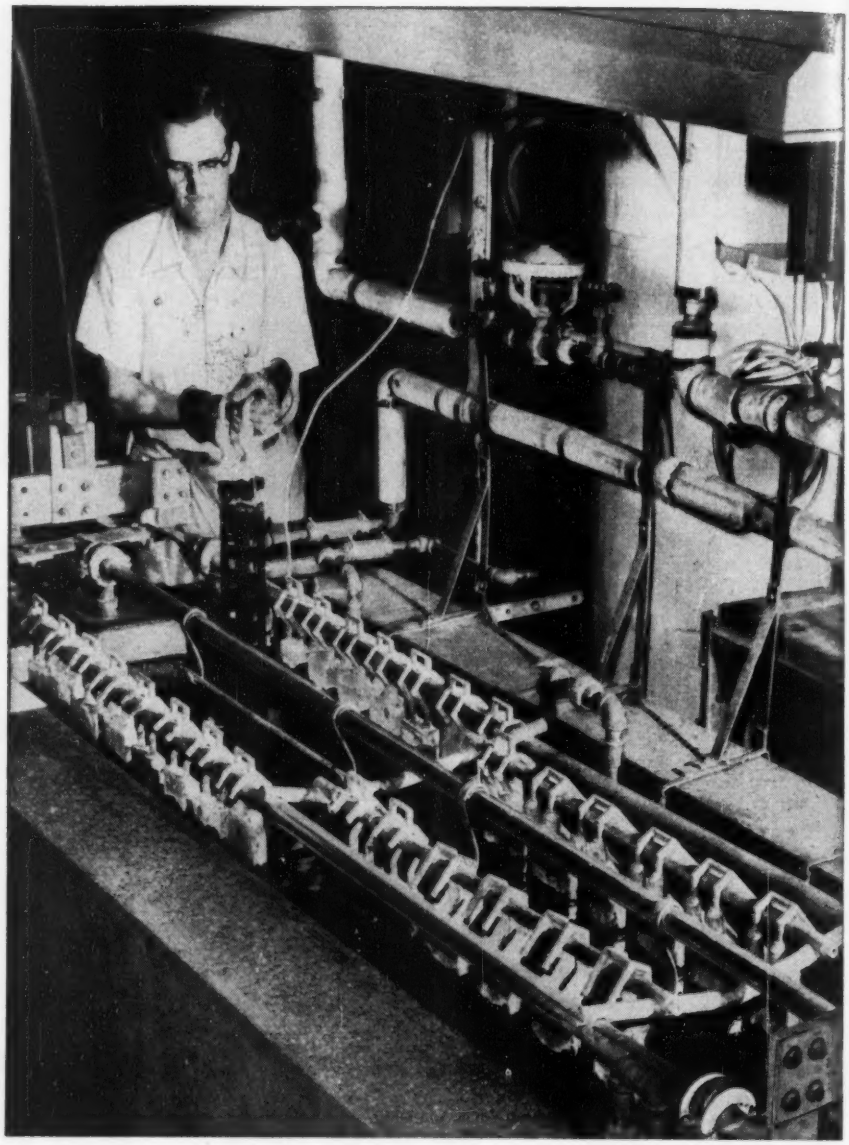
72/Circle on Readers' Service Card

Zinc Phosphating Compound

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

CrysCoat LT, a new zinc phosphating compound for use at low temperatures in spray washing machines, is stated to produce a fine-grained, dense, uniform coating which meets specifications MIL-C-490A, Grade I, and MIL-C-16232A, Type II, calling for coating weights between 150 and 300 milligrams per square foot on steel surfaces. Similar coatings are obtained on zinc.

Designed for application in five-stage washing machines, the product produces quality coatings at temperatures between 120° and 140°. Coating develops rapidly, particularly in deep



FEDERATED PRODUCTS FOR THE PLATING SHOP

ANODES:

Copper anodes in all shapes and forms; lead anodes, including the famous Conducta-Core; zinc anodes, tin anodes, tin-lead anodes, cadmium anodes, brass anodes, silver anodes.

NICKEL SALTS:

Produced by ASARCO under constant quality control that assures full nickel content and identical plating characteristics from every lot.

PLATING ADDITION AGENTS:

Cadmax for still or barrel cyanide cadmium plating; Zimax in liquid or powder form; Nimax for low cost bright nickel plating.

FEDERATED products:

Aluminum, Babbitts, Brass, Die Casting Metals, Fluxes, Lead and Lead Products, Magnesium, Plating Materials, Solders, Type Metals, Zinc Dust

You get better performance every time because Federated Plating Materials are COMPETITIVELY TESTED!

All performance tests conducted by Federated are competitive in order to prove that plating materials sold under the Federated name not only work, but work better!

At ASARCO's Central Research Laboratory no Federated product is approved for sale until it has been thoroughly tested against competitive products. It must contain specific advantages or a better combination of properties. If it doesn't, it isn't ready for sale.

This policy of testing competitively has resulted in many superior plating supplies. Among them are Conducta-Core lead anodes, which have greater throwing power, yet last three or four times as long as other lead anodes. Cadmax, addition agent for cadmium plating: Zimax, for zinc plating and Nimax, a nickel plating brightener, are other recent examples of Federated products developed and formulated to do a better job at lower cost.

The next time your Federated field representative stops in to visit you, ask him about competitive testing. Let him show you how the products he represents will actually work better. It will benefit you.

Federated Metals ASARCO

Division of

AMERICAN SMELTING AND REFINING COMPANY

120 Broadway • New York 5, N.Y.

73/Circle on Readers' Service Card

cavities, thus minimizing the usual rusting difficulties. Solutions are easy to control, and no other material need be added for upkeep. Sludging difficulties are minimized.

74/Circle on Readers' Service Card

Cadmium Plating Process

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

A new cadmium plating process is claimed to produce lustrous bright deposits with exceptionally low brightener consumption. This improved process is stated to increase brightness up to 10%, brightener-life 400%, and plating speeds up to 10%. Results in both rack and barrel plating have been outstanding. For many applications a subsequent bright dip operation is not necessary.

The new process uses two brighteners. One is the Cadalume Make-Up Brightener and is used only when making up a new bath or converting an existing one. The other, called Cadalume Brightener, is used for all maintenance additions.

The new bath is a clear solution, which assists in arranging work in the tank. Most conventional cadmium solutions, or an existing bright cadmium bath, can be converted to the new process by simply adjusting the solution to the required formula, then adding the required amount of make-up brightener. However, a sample solution should be sent to the firm's laboratory, for conversion recommendations.

75/Circle on Readers' Service Card

Air Compressor

Eclipse Air Brush Co., Dept. MF, 390 Park Ave., Newark 7, N. J.

Claimed to be completely safe and tamper-proof by its manufacturer, the new design 505 compressor introduces an automatic unloading control, made

The Leading Name in Immersion Heating

THERE'S A **Glo-QUARTZ*** IMMERSION HEATER for YOUR EVERY HEATING REQUIREMENT

All 3 Types

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- STOCKED FOR IMMEDIATE SHIPMENT

TYPE "U"
PATENT PENDING
World's first successful U-tube **ACID** Heater—Guaranteed to outperform and outlast all other quartz heaters.

TYPE "GN"
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Standard straight tube Quartz **ACID** Heater—Vapor-proof junction box; replaceable heating element.

TYPE "MB"
"Multi-Blade", Metal-sheathed **ALKALI** Heater—Portable, burn-out proof, easy mounting, long life.

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76/Circle on Readers' Service Card

integral with the compressor head.

With this innovation of the automatic unloading control, all tubing springs and adjustments have been eliminated. The only controls on the compressor are the on-and-off switch, which includes the thermal cut-out, and the manual unloader control.

The new unit also has a kick bar which prevents the sturdy 160 lb. compressor from being overturned, and which acts as a storage rack for the electrical cable and hose.

This efficient new model compressor delivers over five cubic feet per minute at 40 psi; will permit actual commercial results from an ordinary household lighting line. Among its other features; Electric ¾ H.P. motor, 110 volt, 60 cycle, single phase, direct current or 220 volt; single cylinder direct driven compressor (no belts or flywheel); 10" rubber-tired wheels, spring foot to insure minimum vibration,removable draw bar; ample storage tank and pulsation chamber with drain cock, 25 feet of heavy duty rubber covered cable, large intake filter and muffler.

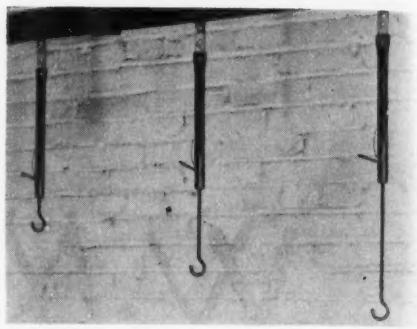
The dimensions are: Length, 24"; width, 26"; and height, 26".

77/Circle on Readers' Service Card

Adjustable Extension Hooks

The Metal Craft Co., Dept. MF, P.O. Box 4597, Cleveland 24, Ohio.

New adjustable extension hooks for conveyor lines used in plating, finishing and other conveyorized operations



eliminate the use of various lengths hooks that get all tangled up. These hooks carry a 150 lb. load and are quickly and easily adjusted in any height from 9 to 16 inches.

These versatile new extension hooks are available for lighter and heavier loads and are also made to any length desired. Made of steel and cadmium plated, they are packed 50 in a box.

78/Circle on Readers' Service Card

Magnesium Finishing

Turco Products, Inc., Dept. MF, 6135 S. Central Ave., Los Angeles 1, Calif.

Two new magnesium finishing processes are offered to replace Dow #17 and Dow #18 treatments. The single-package processes are designed to eliminate the need for precise measuring and mixing of several chemicals and to overcome the resultant inconvenience and chance for error. Additionally, they do not require complicated control procedures. Both processes are approved for use by the Magnesium Division, Dow Chemical Company, it is claimed.

Turcoat 4245-2F (Dow #17) is a production-line process for providing corrosion resistance, paint base qualities and abrasion resistance to all forms and alloys of magnesium. The powdered material is merely mixed with water. The same solution may be used for processing by either direct or alternating current. Hexavalent chromium is the only control required, and the bath is brought back to strength merely by addition of the original material.

Turcoat 4091 (Dow #18) is a liquid process for touching-up coated magnesium that has been scratched or abraded. The process, which does not require electrical current, is also used where assemblies are too large to be immersed. Used as received, the compound is merely brushed or sprayed onto the surface to be coated. It is also recommended for use in a dip tank to replace chrome pickle.

79/Circle on Readers' Service Card

Protective Coating

West Chester Chemical Co., Dept. MF, Box 39, West Chester, Pa.

The above firm has recently introduced a new coating, "Maintz," which is said to provide excellent protection against severe chemical and weather exposure. It is tough and long lasting, forming a resilient coating with exceptional resistance to abrasion, weathering, and chemical corrosion.

The coating is also claimed to have sufficient elasticity to withstand extremes of expansion or contraction without cracking and retaining this property at temperatures as low as –40°F. It is suited for protection of both buildings and equipment.

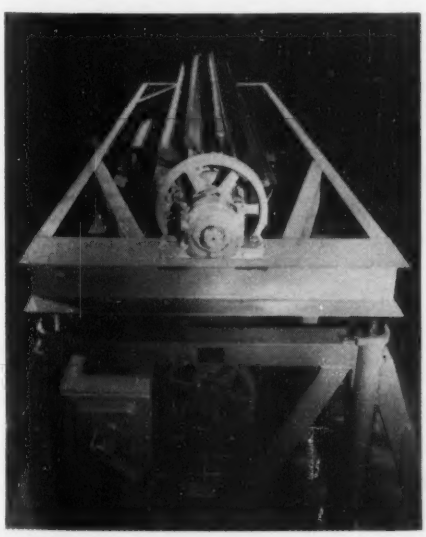
Manufactured in white, black and gray, it can be supplied in a wide variety of pastel colors custom tinted to specification in 55-gallon drum minimum quantities. The product is available in one, five, and fifty-five gallon containers.

80/Circle on Readers' Service Card

Brush-Sanding Drums

Merit Products, Dept. MF, Culver City, Calif.

Brush-sanding drums ranging from 37" to 74" in width are now being manufactured for sanding or polishing wide metal sheets. The illustration shows 74" width drum built and installed at a large Southern California plant for sanding a continuous sheet passing above the revolving drum. A series of fibre brushes spaced around the circumference of the drum back up a series of abrasive strips that feed out from inside the drum and wipe the abrasive against the stock with a smooth resilient action. This action enables the abrasive to sand low areas, warps, or sinks without the necessity of grinding down high spots, achieving a uniform scratch pattern across the entire width and length of the sheet. New abrasive is fed out of the drum as required.



82/Circle on Readers' Service Card

Variable Speed Drum Rotator

Morse Mfg. Co., Inc., Dept. MF, 727 West Manlius St., East Syracuse, N. Y.

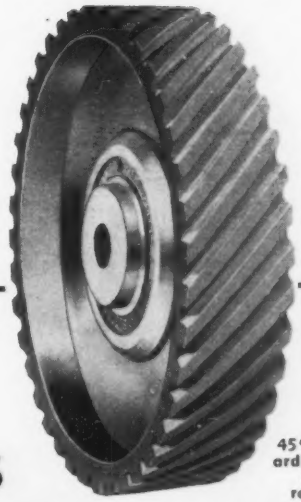
A new stationary drum rotator, Model 1-5154VS, engineered to meet the increased demand for variable speed rotating equipment, for blending, tumbling and mixing, is designed to handle loads from 500 to 1000 lbs. under the most exacting industrial standards.

Equipped with a pre-lubricated, fully sealed ½ H.P. motor, having a 6:1 variable speed gear reduction, the unit can rotate 30 to 55-gallon 24" diameter drums at any speed from 7 to 40 RPM. The motor, which is specially treated to combat damaging condensation from damp environments, connects with a 1" diameter shaft to operate four 6" diameter Neoprene drive wheels. Four 6" diameter roller bearing idler wheels mounted on a ¾" diameter shaft assure smooth running. The idler plate can be adjusted every 2" for various diameter drums. Drive and idler wheels are also fully adjustable to accommodate different drum lengths, and

A BETTER BACK-UP WHEEL

R57

FOR YOUR ABRASIVE BELTS



45° standard used for stock removal

NOW AVAILABLE IN POPULAR 14" DIAMETER SIZES AT BIG SAVINGS

You can get the new R-57 RUBBER CONTACT WHEELS at lower prices in 14" diameter sizes** due to newly developed production techniques. These new wheels have all the well-known features of the R50 and R54 models — LONGER BELT LIFE . . . OIL RESISTANT RUBBER . . . WET OR DRY OPERATION . . . HEAT DISSIPATION . . . MAXIMUM SAFETY . . . other features. And what's more these wheels have a 30% trade-in value.

**The new R57 and the R50 and R54 contact wheels are available in many popular sizes . . . ½" to 22" DIAMETERS in WIDTHS from 1" to 6". Other wheels made to your specifications in all widths and diameters.

14"	WIDTH OF FACE			
TYPE	1"	2"	3"	4"
PLAIN	32.00	34.00	36.00	38.00
SERRATED	37.00	39.00	42.00	44.00

AVAILABLE IN PLAIN OR SERRATED FACE IN ALL DUROMETERS

DElta 6-8900

A WHEEL FOR EVERY OPERATION

45° Scoop Tooth — Aggressive Stock Removal

Slit Serration — Aggressive Contact Work

"X" Serration — Moderate Contour Wheels

Cosmo Expander — Backstand Idler not needed

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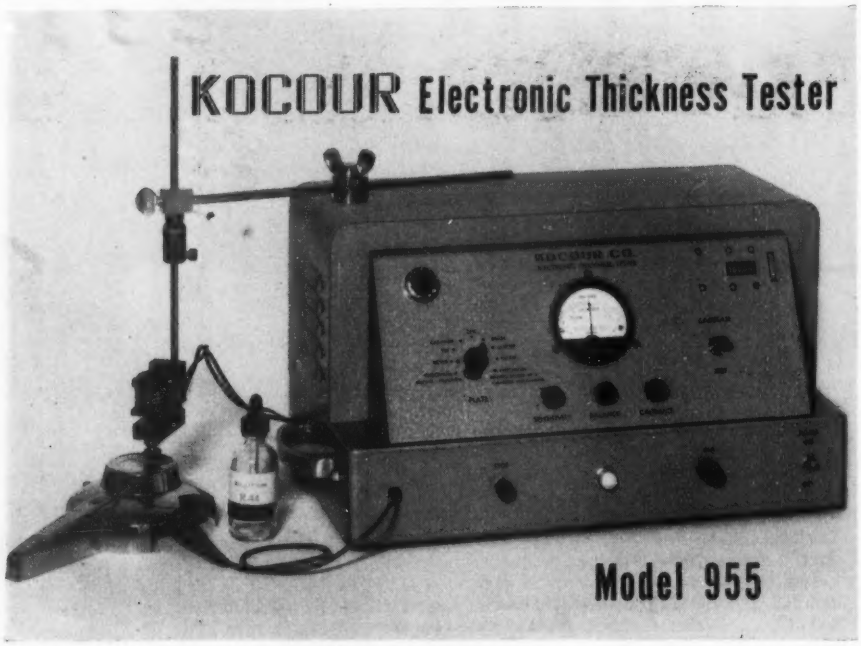


A NEW MODEL . . .
to solve your plating thickness problems!

Here's the New Model 955 . . . the answer to your plating thickness problems . . . a single instrument with a wider application than most other methods. And in addition, human error is virtually eliminated . . . operation is simple and automatic . . . readings are direct . . . accuracy 90-95% . . . results are reproducible . . . average test requires about one minute.

NEW Calibration feature ensures "long term" accuracy!

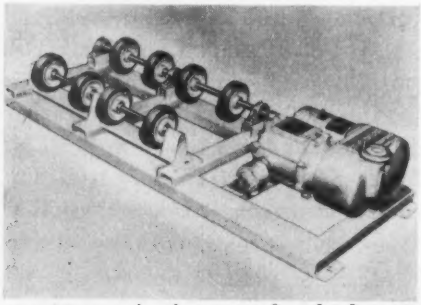
The accuracy of a thickness test can be no better than the accuracy of the method used. The Kocour Electronics Thickness Tester Model 955 gives you direct readings with an accuracy of 90-95%. Furthermore, with the new Calibration feature used in conjunction with Kocour Thickness Standards, you can not only check the accuracy, but calibrate the instrument to automatically correct slightly high or low readings. In addition any malfunctions due to a defective component will be indicated. Don't risk the quality of your product any longer . . . get the details on the New Model 955 today!

Ask for a demonstration or 15-day Free Trial!

KOCOUR CO.
Pioneers in Control for the Plating Industry

4802 S. ST. LOUIS AVENUE **CHICAGO 32, ILLINOIS**

102/Circle on Readers' Service Card



provide ample clearance for the largest drum ribs.

The rotator has an all-welded steel frame, 24" x 65", made of 3" 5 lb. cross channels, and 5" 9 lb. horizontal channels. Four lugs are provided to secure the unit to the floor or similar base.

84/Circle on Readers' Service Card

Organic Coating for Vacuum Metalizing

Logo, Inc., Dept. MF, 12933 S. Stony Island Ave., Chicago 33, Ill.

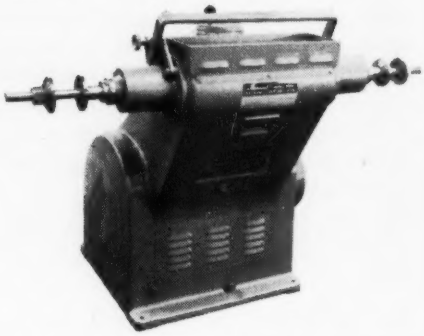
Logo M-241, an improved coating for use in conjunction with vacuum metalizing, is claimed to give 48% better abrasion resistance than standard materials tested and produces a brilliant chrome effect. The material was first developed for the metal toy gun field and is now recommended for any vacuum metalizing operation on metal that requires optimum quality and durability.

The coating requires a ½ hour bake at 325° F. and produces excellent adhesion. It resists repeated pressure-sensitive taping over cross hatched areas. Hardness as measured by the pencil test is between 7H and 9H. It is said to withstand 1500 hours at 110°F. and 100% relative humidity in the humidity cabinet.

85/Circle on Readers' Service Card

Variable Speed Polishing Lathe

Hammond Machinery Builders, Inc., Dept. MF, 1601 Douglas Ave., Kalamazoo, Mich.



The Model VRO variable speed polishing and buffing lathe can now be furnished with a special braking bar. Machines with a single brake handle are still available, but this special brake bar allows the operator on either side of the lathe to actuate it. This is an extra safety feature and a convenience. It also allows a man on a "sit-down" operation to operate the brake without rising, and either operator can do it.

86/Circle on Readers' Service Card

Industrial Vacuum Cleaner

Hild Floor Machine Co., Inc., Dept. MF, W. Washington Blvd., Chicago 6, Ill.

Model 655 is a new high powered outside bag industrial vacuum featuring two 1⅓ h.p. motors with a new propeller design. This machine has the greatest CFM per ampere of power of any portable vacuum cleaner, yet it will not overload most power lines. It fits any 55 gallon drum and the vacuum unit transfers from drum to drum in seconds to speed heavy volume wet or dry cleaning. It can be used with one or two motors depending on the job and each motor can be detached for use as a portable blower or "Strap-Bak-Vac."

87/Circle on Readers' Service Card

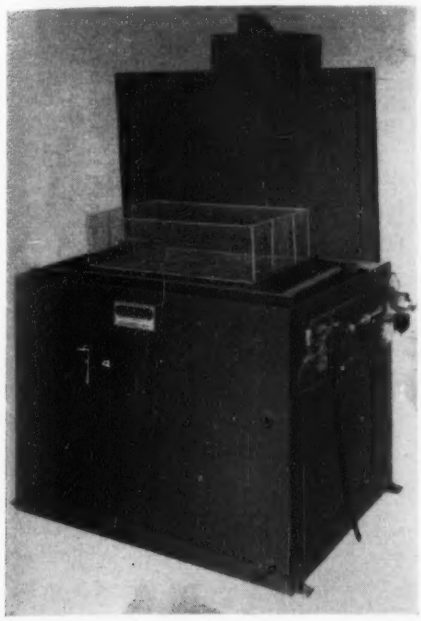
Cleaning Machines

Circo Equip. Co., Dept. MF, 51 Terminal Ave., Clark, N. J.

Available in two models, the MPC-3 and MPC-4 are pneumatically operated power agitation cleaners and fully auto-

matic, can be used cold and also available with steam, gas or electric heat.

The units which are designed for



universal applications in the parts cleaning field, are adaptable for use with all solvents, alkalies and acidic solutions. The powerful air-cylinder agitating action cleans fast and effectively. The machines incorporate combination settings for washing, prewashing, rinsing and drying, and there is a convenient three-way control valve for automatic raising and lowering of the work platform to waist level for easy loading and unloading.

Compact outside dimensions and extraordinary interior tank capacity, economical operation and conservation of cleaning agents mark the machines as outstanding improvements over past metal parts cleaning machines.

Developed as a low-operating-cost,

MPC—5

budget machine, the MPC-5 not only carries a low purchasing price, but is surprisingly economical to operate because of its effective use of cleaning agents, and because it does not entail the use of skilled labor. This machine is available for cold operation or with steam and electric heat, and is motor operated.

This unit is economical on floor space, too, having been designed with tight outside dimensions and large interior tank capacity. Its fast, effective action saves costly time-consuming labor steps and, with its easy loading and unloading features, shops always look clean and efficient.

89/Circle on Readers' Service Card

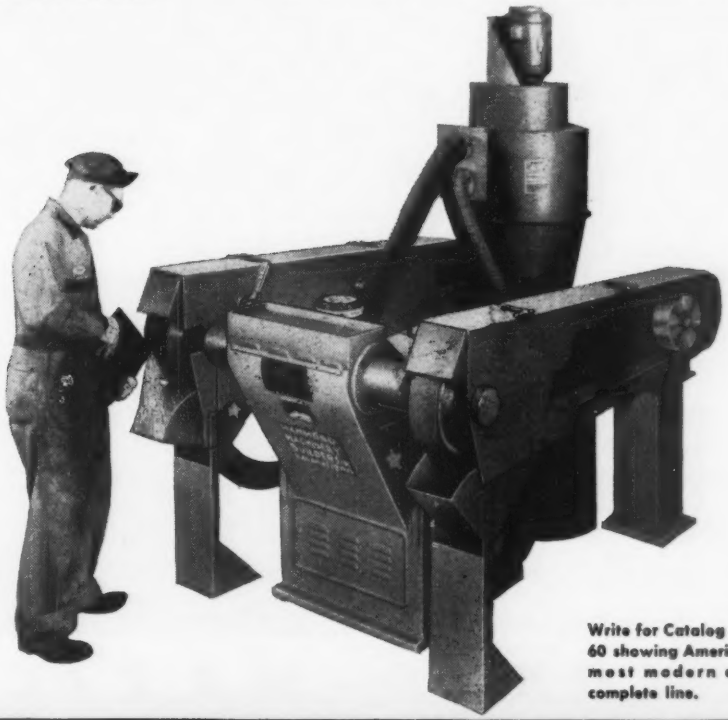
Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

MODERN Self Contained GRINDER-POLISHER

Hammond Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe. Models up to 50 HP available.

Hammond Cyclone Duskolector. One of a wide line of Cyclone and Filter Types.

Hammond Backstands. 10 Air and Spring Tension Models to choose from.



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Hammond Machinery Builders INC
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See Us at Booth 165 — Western Metal Show — Los Angeles — March 25-29
88/Circle on Readers' Service Card

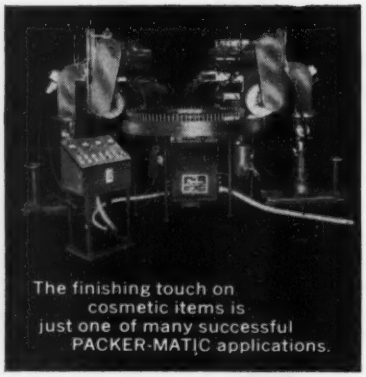
Surface Active Agents

Olin Mathieson Chem. Corp., Dept. MF, 460 Park Ave., New York 22.

A line of nonionic surface active agents for general industrial use is being marketed under the name Poly-Tergent.

Four members of the line are being offered initially with others to follow. All of this first group are alkyl phenol polyglycol ethers. They are liquids made from petroleum-base materials. B-200 is useful in solvent systems as a detergent and dispersant and where reduction of interfacial tensions will aid in wetting and spreading. As an emulsifier, it may be used alone or in

Whatever your finishing requirements may be a PACKER-MATIC is the machine for you. Cost conscious mass producers have recognized the need for high speed, automatic polishing and buffing machines. Let Packer's engineering and developing departments recommend a PACKER-MATIC to meet your demands for faster, more uniform, low cost polishing, buffing and deburring. Send blueprints of parts or samples and we will tell you what PACKER-MATIC can do for you or write for more complete information today.



The finishing touch on cosmetic items is just one of many successful PACKER-MATIC applications.

PACKER-MATIC

THE PACKER MACHINE COMPANY • MERIDEN, CONN.

Pioneer Manufacturers of Automatic Polishing and Buffing Machines

90/Circle on Readers' Service Card

combination with the more hydrophilic types.

B-300 possesses outstanding properties as a wetting agent, detergent, emulsifier and dispersant. It is completely soluble in water up to temperatures of 52-56 deg. C. and in some organic solvents.

G-200 is intended primarily to serve as an emulsifying agent and associate emulsifier. It is useful in many solvent systems to increase detergency, dispersibility and wetting action.

G-300 is completely soluble in water up to 62-70 deg. C. and in a number of organics. Highly stable chemically, it is a good wetting agent, detergent and dispersant over a wide range of conditions. It gives good emulsions with aromatic solvents, chlorinated paraffins, and vegetable oils.

All of the above are available in tank cars and in 5-gallon and 55-gallon drums.

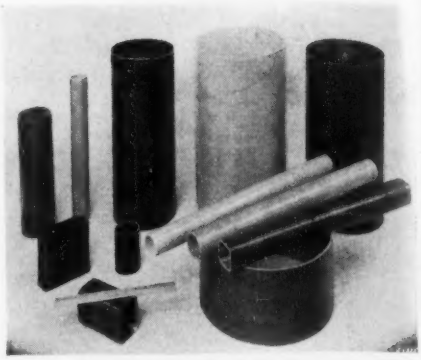
91/Circle on Readers' Service Card

Square Plastic Tubing

Valco Corp., Dept. MF, 1710 Roblyn Ave., St. Paul 4, Minn.

Square tubing material is of a reinforced plastic construction, utilizing a polyester or epoxy resin and is custom engineered to the customer's specification.

The new tubing has the same chemical resistance as the round product and can economically handle most acid



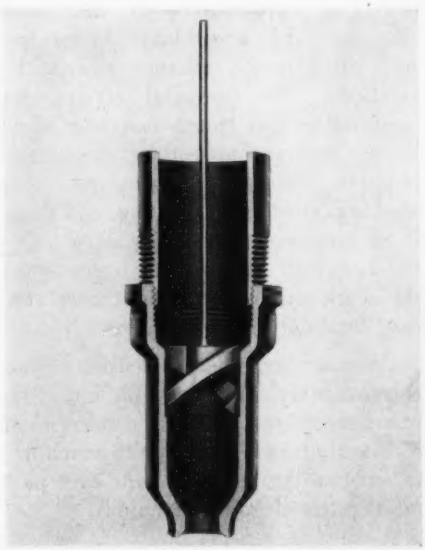
and alkali liquids and fumes. It has a low fluid friction factor and will not support the growth of fungi.

92/Circle on Readers' Service Card

Spray Nozzles

Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.

When spray nozzles must be mounted at hard-to-get-at places, the cleaning job is often a tough one. To simplify this type of maintenance, a new design



Fulljet nozzle has a pull-out-vane. The vane of this nozzle is made with a small female threaded connection to receive a pull-out rod, to be installed by the user in whatever length required. The rod extends back inside the pipe to some connection point that is easily accessible. When cleaning is needed the vane is merely drawn back through the pipe, removed and cleaned while the nozzle itself is flushed out.

This new nozzle is supplied in a range of sizes and capacities.

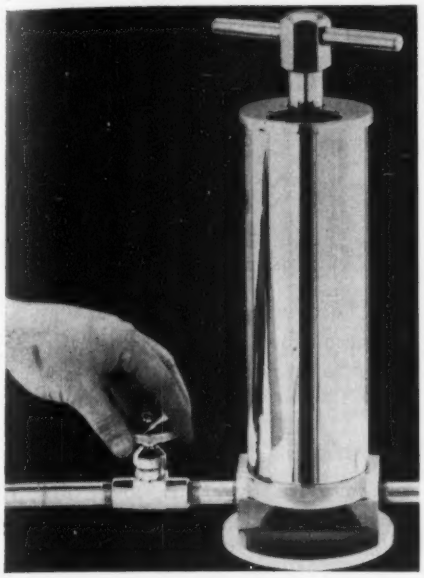
93/Circle on Readers' Service Card

Water Filter

Heico, Inc., Dept. MF, 25 N. 6th St., Stroudsburg, Pa.

The MIK permanent cartridge makes

possible the production of physically pure water that heretofore could be produced on a very limited supply. Capacities range from 3 to 10 gallons per minute and remove all physical

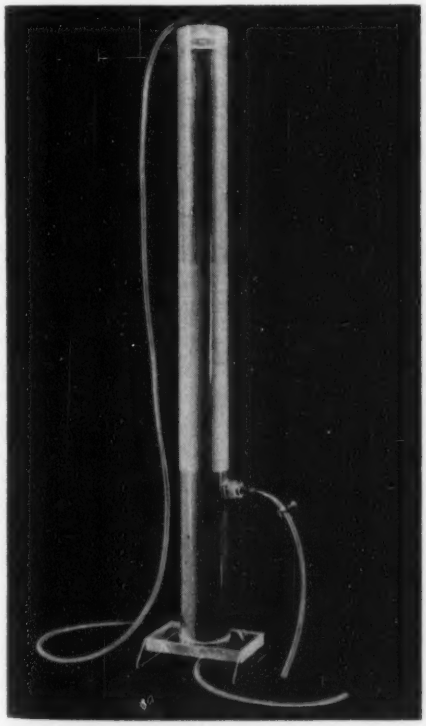


impurities larger than the rated densities of the cartridges. The cartridges are available in the following densities: 25, 10, 1 and 0.1 microns.

94/Circle on Readers' Service Card

Demineralizer

Barnstead Still & Demineralizer Co., 223 Lanesville Terrace, Boston 31, Mass.



Purification by ion-exchange to produce water with resistance of over 1,000,000 ohms per cc. is now made possible with the new MM-O mixed-bed regenerative demineralizer.

The manufacturer states that this unit removes approximately 1100 grains per regeneration. The unit consists of a transparent plastic column mounted on a plastic base with molded plastic fittings top and bottom. It is shipped as a complete unit with plastic tubing and distributor which aids in regenerating resins. Base is 8″ x 8″ and height is 51″. Flow rate is from 10 to 30 gallons per hour.

96/Circle on Readers' Service Card

Temperature Control

Carl Buck & Associates, Dept. MF, Essex Fells, N. J.

A new temperature control unit is stated to be immune to the corrosion problems which occur in handling plating, anodizing, and pickling solutions.

This complete unit can be readily installed on any Camac heat exchanger. A short section of Karbate (or other material suitable to the solution being handled) pipe is inserted into the suction line between tank and exchanger pump. The thermal bulb is strapped onto the insert pipe and covered with insulation. The bulb does not impede the flow nor come in contact with the solution; therefore, corrosion cannot attack either the bulb or capillary tubing. The control for setting and registering can be located at any convenient location, a safe distance from the corrosive solution tank. A solenoid valve,

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FUSED QUARTZ
IMMERSION HEATERS
FAMOUS THROUGHOUT
THE PLATING INDUSTRY
For Quality, Efficiency, Low Cost Operations
OVER 100,000 INSTALLATIONS
For alkaline or acid heating jobs, you can depend on
CLEPCO ELECTRIC IMMERSION HEATERS
CLEPCO STEEL and STAINLESS HEATERS
will meet all your specific needs.
Low Heat Density — Long Life — Vapor-proof junction Box.
See Your Plating Supply House.
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1965 EAST 57TH STREET • CLEVELAND 3, OHIO

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PIONEERS *and* LEADERS

DAVIS-K GOLD PLATING SOLUTIONS

in ELECTROLYTIC PRECIOUS METALS

Through the years, Davis-K has continued to lead the field in producing low cost solutions, time-saving procedures and revolutionary new electroplates. From Davis-K research laboratories have come two of the most outstanding developments in recent years.

ONE OPERATION

***First* with Antique Gold Solution**

An inexpensive, quality electroplate with excellent color consistency and remarkable ease of operation.

***First Again* with HARD GOLD SOLUTION**

FOR PRINTED CIRCUITS AND ELECTRONIC PARTS

Davis-K Hard Gold Plating Solution is an amazing new electroplate for the electronic industry which cuts gold deposit 50% while forming a lasting bond with either metals or plastics. Requires no elaborate set-up, has maximum resistance to high frequency, plates at low temperature and eliminates control problems.

OTHER DAVIS-K PRODUCTS

★ POTASSIUM GOLD CYANIDE SALTS

★ LUSTROUS WHITE RHODIUM SOLUTION

Now available: variable-type Tank Rheostats, specially designed for precious metal plating.

***FREE* Consultive Service!**

As an added service, Davis-K process engineers are available for consultation concerning special plating problems and installations.

ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:

- made in all colors
- color constant
- tarnish-resistant
- brilliant in finish
- bottled by Troy weight
- made from assayed US Treasury Gold only
- Ready for immediate use

We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating. Write Dept. MFG-57 for details!

"Where Glittering Elegance Reflects Lasting Quality."

100% PURE GOLD DKP SOLUTIONS

DAVIS-K PRODUCTS, CO.

135 West 29th St., New York 1, N. Y.

LOngacre 4-1978-9

97/Circle on Readers' Service Card

which is included and matched to the unit, is installed in the steam or coolant line where it enters the heat exchanger.

Continuous reliable accuracy of temperature control and longer more economical service are assured because these units avoid the common difficulties encountered where corrosive solutions are handled. Both heating and cooling services can be regulated by the same control unit with equal accuracy and efficiency. Two models are now available. Series P includes indicating dial showing actual tank temperature. Series R does not indicate. Both models are knob set on controller for desired temperature.

98/Circle on Readers' Service Card

Temperature Indicating Paint

EverLube Corp., Dept. MF, 6940 Farmdale Ave., North Hollywood, Cal.

Tempa-Dot, a new "time-and-temperature" indicating paint was developed for application to heat treated parts that have been electroplated, pickled or phosphate treated to permit visible proof that each part has been baked to relieve hydrogen embrittlement. It is packaged in a handy spot applicator tube that cuts labor cost drastically.

The paint appears as a vivid red dot before baking and changes color after the proper hydrogen embrittlement bake. The color reaction is claimed to

be accurate to plus or minus 25°F.

The product is packaged in half dozen packs at $7.50 half dozen.

99/Circle on Readers' Service Card

Stainless Dispensing Faucet

Economy Faucet Co., Dept. MF, 12 New York Ave., Newark 1, N. J.

An improved corrosion-resistant faucet Model U-008, for dispensing corrosive and inflammable fluids is fabricated of 304 stainless steel throughout.

The ultimate in safety has been achieved in the design and construction of the faucet. Metal to metal contact has been eliminated in the operation of the valve by the introduction of Kel-F fluorcarbon seal rings. In tests conducted by Factory Mutual Laboratories, the anti-flash screen successfully prevented propagation of any flames entering the storage drum through the spout in the handling of inflammable solvents. This self-closing faucet opens against coil spring pressure and insures positive shut off when not manually held open. A guard prevents the faucet from being jammed in the open position. Exclusive design with Kel-F seals assures no after drip.

This universal faucet can be disassembled quickly for cleaning. Only three moving parts assures minimum maintenance. The shank is supplied in

interchangeable sizes of ⅜", ¾" and ½" with tapered threads to allow a snug fit in bung threads of dispensing drums.

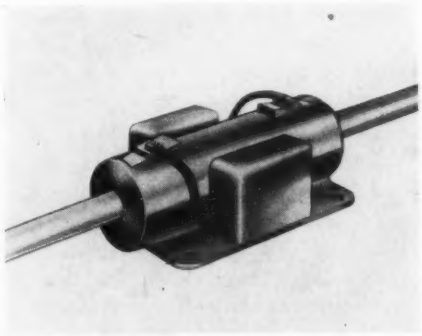
100/Circle on Readers' Service Card

Flowmeter

Gulton Industries, Inc., Dept. MF, 212 Durham Ave., Metuchen, N. J.

A new straight-through flowmeter achieves accurate flow rate measurements by the modification of an ultrasonic beam. Because this new instrument offers no obstructions to the fluid flow, pressure drop is eliminated, maintainance is simplified and greater accuracy is consistently attained.

This unit designated as Glennite Model UF-100, will measure flow rates in the range of 1000-4000 gallons per minute with an accuracy of better than



1%, and provides 5 volts full scale output to feed into standard telemetering and recording systems.

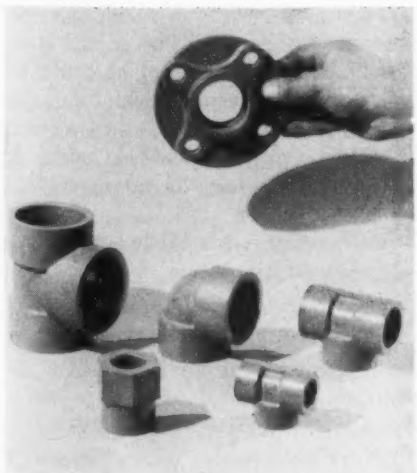
Special instruments for the measurement of volumetric flow, and complete control systems designed around the flowmeter, can also be provided.

101/Circle on Readers' Service Card

Plastic Pipe Fittings

United State Rubber Co., Dept. MF, Rockefeller Center, New York 20, N. Y.

A thin layer of plastic on part of the



inside wall of these Uscoweld plastic fittings promise to do away with the problem of leaks at joints in plastic pipe installations. The plastic layer, which makes the fitting socket smaller than the pipe fitted into it, is dissolved by solvent cement when the joint is made and the pipe end can be pushed snugly into place. High contact pressure between fittitng and pipe end then causes a positive, leak-free welded joint.

103/Circle on Readers' Service Card

Controlled Air Nozzle

Mortimore Mfg. Co., Dept. MF, 72 Broadmere Road, Stratford, Conn.

An operator can now have complete control of air flow, from a slight puff to a full blast, without jumps from low to high or high to low. The Controlled Air Nozzle has only two working parts and is made without springs. It is fabricated of a strong, heat-treated aluminum alloy. The removable nose will take a ⅛ inch pipe thread extension. The 45 degree angle of the nose proves an immeasurable aid in aiming the nozzle.

The unit is rugged, although weighing only 5½ ounces, with a sturdy hook for hanging the gun. The complete cost of the air gun is only $2.00 for a ⅜" line. A bushing is available for ¼" lines at an additional charge of 10c.

104/Circle on Readers' Service Card

HANDY & HARMAN
SILVER ANODES

Regardless of form, all Handy & Harman Silver Anodes are made of the same super-fine silver—silver fabricated by an exclusive production process that... maintains the highest standards of fineness... removes every trace of impurities detrimental to plating... assures consistent uniformity. These 999+FINE Anodes are turning out top-quality, trouble-free plating for thousands of manufacturers. They'll do the same for you. TRY them and see the difference.

A WORD ABOUT REFININGS

Send your silver plating solutions and other precious metal scrap, sweeps and waste to us for refining. Specially perfected scientific methods and equipment plus highly skilled technicians and long experience assure you of an *accurate return* from every lot. Send us your next shipment and let returns speak for themselves.

HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

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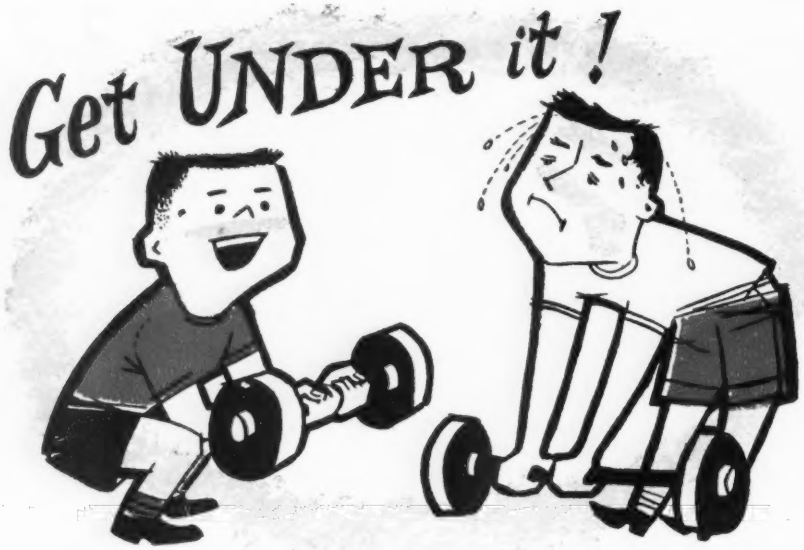
81/Circle on Readers' Service Card



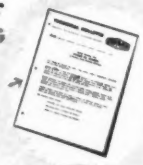
You'll lift more than you can pull with a metal cleaner, too—if you can get your cleaner under the soil. That's the way you'll clean with . . .

Cowles NEW QC WASHING MACHINE CLEANER

Cowles QC Cleaner gets under the soil—even where pressure spray jets won't reach—wets the soil thoroughly—pries it loose—disperses and emulsifies loosened soil.

All this in one quick trip through your washer
WITHOUT OBJECTIONABLE FOAMING

Get the complete story on this brand new Cowles QC Washing Machine CLEANER



SEND THIS COUPON—GET THIS TECHNICAL BULLETIN

Cowles Chemical Company
7014 Euclid Avenue • Cleveland 3, Ohio
Send Technical Bulletin on Cowles QC Washing Machine Cleaner.
Name_____
Company_____
Address_____
City_____ State_____

Cowles CHEMICAL COMPANY
CLEVELAND 3, OHIO

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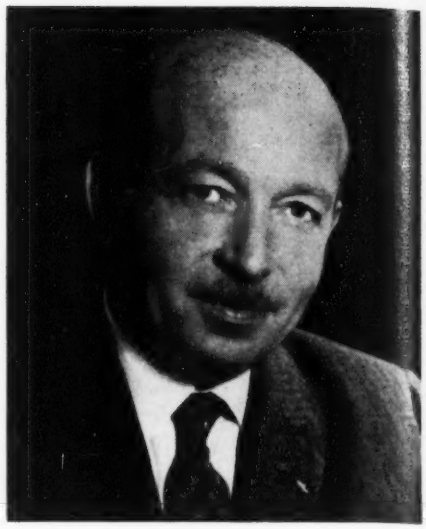

Morris M. Messing

BUSINESS ITEMS

Bart-Messing Merges with Sel-Rex Corporation

The merger of *Bart-Messing* and *Sel-Rex Corporations*, both of Newark, New Jersey, effective January 1st, 1957, has been announced by the board of directors of both companies. The company trademark — an elongated diamond with the legend "Sel-Rex" superimposed in a distinctive script — will be retained and all company products will continue to be marketed under this trade name.

The business conducted by each of the companies individually will hereafter be carried on by separate divisions of the new Sel-Rex Corporation: Precious Metals Division, under the direction of *E. C. Rinker*, vice president, will handle the manufacture and marketing of precious metals salts, solutions and electroplating processes; Rectifier Division, headed by *E. R. Redlhammer*, vice president, will manufacture and market rectifiers, filters, and an automatic, portable electroplating machine known as the Jet Plater; Chemical Division, under the personal supervision of *Morris M. Messing*, president, will cater exclusively to the needs of the metal finishing and electroplating industries, with an extensive line of equipment and supplies.

Other officers of the new corporation are: *S. S. Wilson*, vice president in charge of the company's Detroit and Chicago offices; *Lucien R. Collart*, secretary-treasurer; and *Frank W. Brearley*, assistant secretary.

Executive offices, as well as rectifier and filter manufacturing facilities, have been established at 155 Manchester Place in Newark, N. J. Plans are currently being formulated for the centralization of the entire manufacturing and precious metals laboratory facilities in a new building which is to encompass approximately 40,000 square feet.

Kaykor Industries Names New East Coast Representative

Appointment of *Herbert E. Rubin* to represent Kaykor Industries, Yardville, New Jersey, was announced recently. Mr. Rubin will contact fabricators, applicators, and the chemical processing, food processing, metal finishing — electroplating industries in Delaware, Maryland, Virginia, and the District of Columbia, providing engineering assistance in the selection and application of polyvinyl chloride materials for corrosion-resistant construction. Mr. Rubin's office address is 627 Roberts Court, Aberdeen, Md., his telephone number, Aberdeen 497.

MacDermid Adds Midwestern Representative

The midwestern sales territory of *MacDermid Inc.*, Waterbury, Conn., will receive additional coverage with the appointment of *Fenton Liffick* as sales representative.

Working closely with *Edward F.*

Fenton Liffick

Stack, the present sales representative in that area, Mr. Luffick will concentrate on sales of the company's line of metal cleaning, plating and finishing chemicals and compounds in Iowa, Wisconsin, Minnesota and northern Chicago.

Mr. Liffick brings a wide and varied background of metal finishing experience to the newly created post. He has been an analyst, plating foreman and plating room superintendent. More recently, he was employed by the Promat Division, Poor & Co., Waukegan, Ill., as a customer service laboratory technician, assistant research director and sales representative, his most recent position before joining MacDermid.

Diamond Promotes L. J. Polite, Jr.

Promotion of *L. J. Polite, Jr.*, to product sales manager of the *Chlorinated Products Division* of *Diamond Alkali Co.*, Cleveland, Ohio, was announced at the firm's national headquarters. Sales manager for certain major Diamond organic chemicals during the past year, Polite will now hold overall sales responsibility for the complete, diversified line of chlorinated products manufactured by the company.

A veteran of 15 years' service with the firm, Polite joined the company as a sales representative in 1942 following graduation from Williams College where he earned a B. A. degree. In February, 1952, he was named assistant sales manager of agricultural chemicals and made his headquarters at the eastern agricultural chemicals plant in Newark, N. J. Returning to the company's general offices in Cleveland two years later, Polite was promoted to agricultural chemicals sales manager. In February, 1956, he was assigned sales management responsibility for selected organic chemicals.

A World War II veteran, Polite served with the U. S. Navy in the Pacific area from 1942 to 1945. A Pennsylvanian, born in McKeesport, he is a member of the Chemists Club of New York, the Williams Club of New York, and the Cleveland Athletic Club.

H-VW-M Names Koehler to Electrical Sales Post

Hanson-Van Winkle-Munning Co. has announced the appointment of *Henry B. Koehler* as electrical sales engineer. In this capacity Mr. Koehler will concentrate on the engineering and sale of motor generator equipment for the metalfinishing industry. His appointment follows completion of an intensive training program in electroplating and allied processes at the firm's main plant.

Prior to joining H-VW-M he was with the Public Service Electric and Gas Co. for eight years, serving as a power representative in the company's New Jersey territory. During this period he was primarily concerned with selling power to industrial installations.

Mr. Koehler is a graduate of Rutgers University, where he received his B. S. degree in 1948. He was treasurer of the New Jersey chapter of the Amer-

THE NEW VERSATILE NON-DESTRUCTIVE COATING-THICKNESS TESTER

DERMITRON

Unit Process Assemblies, Inc., pioneers in non-destructive testing and specialists in electronics for metal finishing, offer their latest DERMITRON D-2 with these features:

- Measures plated coatings on steel, brass, copper, zinc die-cast, aluminum, nickel-silver, bronze and other metals; also nickel on steel.
- Measures anodize and hard-coat on aluminum and magnesium; also paint, porcelain, organic coatings on non-ferrous metals.
- Measures metal coatings on plastics, ceramics and other non-metallic materials.
- Sorts or matches metals and alloys.
- Available with FOUR measuring probes for extra-wide thickness ranges from thin to thick deposits.
- Special probes can be provided for measuring on internal diameters, small diameters and otherwise inaccessible areas.
- Only 1/8" circle area required for measurement.
- You get fast, accurate, direct readings plus versatility and portability.

Write for latest brochure and questionnaire to help solve your thickness testing problems.

UPA UNIT PROCESS ASSEMBLIES, INC.
61 East Fourth Street • New York 3, N. Y.

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HIGHER LUSTRE
IN BARREL TUMBLING FOR ZINC DIE CASTING

You can save as much as 90% in time in barrel processing zinc and aluminum die castings with specially developed **PERMAG** compounds.

FOR BARREL COLORING—
PERMAG #338

It will save you time and money. It takes only 45 minutes with but ⅓ of an ounce per gallon of **PERMAG #338**, to do a superior job on a barrel-load of zinc and aluminum die castings. For far better jobs, investigate the many advantages of **PERMAG #338**.

FOR BARREL DEBURRING—
PERMAG #370

Satisfactory results in your deburring operations are possible with **PERMAG #370**, specifically developed for barrel deburring of all metallic parts. **PERMAG #370** is efficient, economical and also useful as a rinsing agent.

Write today for samples and complete data on these and other **PERMAG** compounds, or for the assistance of **PERMAG** technicians on any tumbling or cleaning problems you may have.

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PRODUCTS CORPORATION
50 COURT ST. BROOKLYN 1, N. Y.
In Canada: Canadian PERMAG Products, Ltd., Montreal

Henry B. Koehler

ican Materials Handling Society for two years.

Change of Address for Kaykor West Coast Representative

G. Gordon Schmuck, West Coast representative for *Kaykor Industries,* Yardville, N. J., announces the removal of his office to 46 Skipper Road, Pittsburg, Calif., and a new telephone number, Gladstone 8-4487. Mr. Schmuck will continue to offer engineering assistance to West Coast industry in the selection and application of plastics for corrosion-resistant construction.

Harshaw Promotes Executives

The Harshaw Chemical Co. has announced the promotion of two executives. *William A. Harshaw II,* grandson of the founder, and son of Chairman *W. J. Harshaw* has been elected vice president-research, and *Leslie N. Smith* was named vice president-scientific division.

William A. Harshaw II

Harshaw, who obtained his Bachelor of Science degree from Western Reserve University, started with the company in 1944 in research and sales. He became sales manager of the development department in 1951 when he also was named assistant secretary. In 1953 he was promoted to manager of the Philadelphia branch. He now will make Cleveland his headquarters.

Smith who joined the organization in 1919 has handled a varied group of assignments in the laboratory, in cost accounting and as manager of the general sales office. Member of the Electrochemical Society, he was for twenty years active in sales and development in the field of electroplating. During this time he was prominent in the pioneering of today's advanced types of nickel anodes and bright nickel plating process. For fifteen years of this

Leslie N. Smith

period he was sales manager for the company's electroplating products and processes. In 1951 he was appointed general manager, Scientific Division and will continue in charge. He attended Fenn College during his business career.

Esselstyn Promoted by Diamond

Promotion of *William J. Esselstyn* to manage organic intermediates and new product sales for the *Chlorinated Products Division* has been announced by *Diamond Alkali Co.,* Cleveland, Ohio. At his newly-created position, he will hold sales responsibility for chlorinated intermediates and related organic chemicals. He will also coordinate divisional technical service activities covering solvents and organic intermediates, and supervise bulk-terminal operations on these products.

Esselstyn joined the organization as

William J. Esselstyn

a chemist in 1947, and became a technical service representative in 1950. He was subsequently named sales promotion representative for solvents in the Chlorinated Products Division in March, 1954.

A native of Lansing, Michigan, Esselstyn in 1947 earned a B. S. degree at Otterbein College, Westerville, O. He is a member of Sigma Zeta, national honorary science fraternity, and Sigma Delta, social fraternity. A World War II veteran, he served in the U. S. Army from September, 1942 to April, 1946.

Sales Manager Appointed at Graver

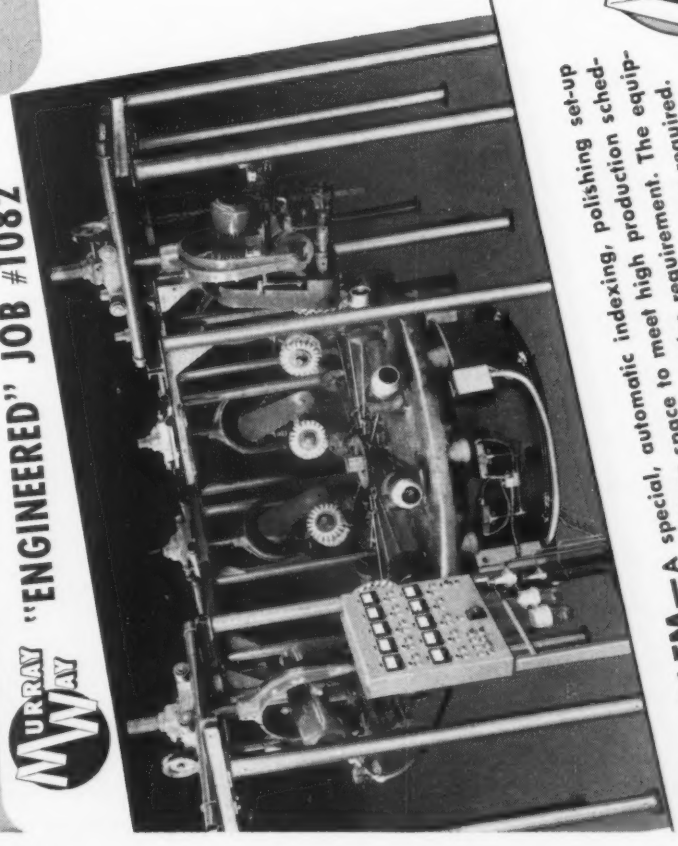
Graver Water Conditioning Co., New York manufacturers of industrial and municipal water treatment and industrial waste treatment equipment has just announced the appointment of *Vincent J. Calise* as general sales manager. Mr. Calise has spent more than 17 years dealing with all aspects of business in these fields. He is the

Vincent J. Calise

"ENGINEERED" JOB #1082

MURRAY WAY

PROBLEM—A special, automatic indexing, polishing set-up for minimum floor space to meet high production schedules with a minimum of service requirement. The equipment to be easily converted to other uses as required.



SOLUTION—

One, standard design, Murray-Way ten station indexing dial-table, with special features.

Eight, universal floating type, Murray-Way polishing heads, with special overhead mounts.

One, special Murray-Way engineered control system.

Ten, Murray-Way designed mounting fixtures.

RESULT—A high production, easily operated polishing set-up with a minimum of occupied floor space. Retractable heads for convenient wheel change. Overhead, head-mounts afford maximum open floor space. Push button controls. A unique, automatic wheel-pressure hunting device. Sturdy dial-table with oversize center-bearing and special anti-friction, hardened rollers for outside support, to reduce wear. Automatic indexing mechanism with continuous motion or adjustable dwell. The entire installation engineered by Murray-Way for easy interchange of fixtures and parts accommodating a wide variety of work.

MURRAY WAY

MURRAY-WAY CORPORATION

P. O. BOX 180, MAPLE ROAD EAST · BIRMINGHAM, MICH.

Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts costs.

You too can profit by the combination of Murray-Way's time-tested line of equipment and Murray-Way's specialized engineering. We'll gladly discuss your buffing, grinding and polishing problems.

109/Circle on Readers' Service Card

holder of both Chemical Engineering and Mechanical Engineering degrees and is a widely known speaker and authority on water and waste treatment. He is a licensed Professional Engineer in the State of New York.

Michigan Abrasive Appoints Martin

William J. Martin, prominently identified for many years with abrasive service and sales work, has just been appointed district manager for *Michigan Abrasive Co.* in the Cleveland-Columbus-Pittsburgh Area.

As a service engineer for many years with Peninsular Grinding Wheel Co. and as a widely-known officer and member of the Northeast Ohio Chapter of American Foundry Society, Martin is acquainted with abrasive users in all industrial areas of Ohio and western Pennsylvania.

William J. Martin

Bissell Elected President of Chromium Corp. of America

Donald H. Bissell has been elected president of *Chromium Corp. of America*, 100 Park Ave., New York 17, N. Y. He formerly was vice president & secretary and has been succeeded in this position by *Charles H. Belvin*.

Mr. Bissell has extensive experience in the field of job electroplating having been connected with the firm, most of the time in an official capacity, for more than 30 years. The corporation was the first to commercialize chromium plating and has been instrumental in the development of many of the industrial application used for engineering purposes today.

H-VW-M Expands Buffing Engineering Service

Hanson-Van Winkle-Munning Co. has announced the appointment of *Alexander Alexander* to the post of finishing engineer in its Chicago area.

In this capacity, Mr. Alexander will assist H-VW-M salesmen in fifteen midwestern states in problems and service relating to the buffing and polishing of metals and plastics.

Alexander is well qualified for this type of work by many years of experience as a buffing foreman, set-up engineer in buffing and polishing applications and job shop owner. Prior to 1950, he operated in this industry in Michigan and Wisconsin. Since then, he has worked in the Chicago area.

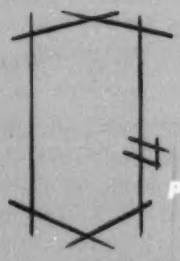
Although his experience in buffing

Alexander Alexander

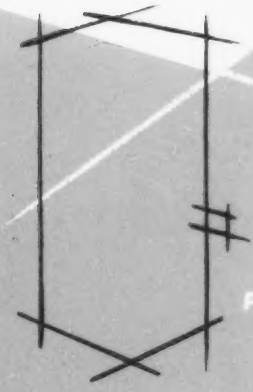
Bulletin ER-110

Another **H-VW-M** *first!*

POWERTRON
GERMANIUM RECTIFIERS



Completely New Models
Outstanding New Features
Much More for the Price
Fast Delivery From Stock



HANSON-VAN WINKLE-MUNNING COMPANY
MATAWAN, NEW JERSEY
Offices in principal cities

H-VW-M
POWERTRON

the best answer for most

Powertron—the exclusively new H-VW-M germanium rectifier—combines in *one single unit* many of the advantages of larger units, but at much lower cost. Simple controls, maximum efficiency and built-in long life quality make Powertron the best buy in rectifiers for production plants, large and small, for job plating and for other low voltage DC application.

To keep your costs low, H-VW-M design and production engineers have concentrated on four standard new-type Powertrons—all of which have a range of 44 voltage adjustments.

The four rated outputs—750, 1500, 2500 and 5000 amperes, all in the 2 to 6, 7 to 12 volt range—are the ones most often used for still tank and barrel plating, including many automatic plating installations.

Check the outstanding advantages and features of the new Powertron rectifiers. See how these unit power packs can help you to more profitable plating.

SPECIAL ADVANTAGES

- New low price
- New high efficiency—up to 90%
- New self-contained, completely packaged unit
- Excellent voltage regulation
- Low D. C. voltage ripple—only 5%
- Minimum maintenance requirement

OUTSTANDING FEATURES

- Exclusive non-fuse, magnetic DC protection system
- New air-cooled germanium junction diodes with minimum voltage drop
- Oversize class B transformer
- Positive, 44-positions of output control from 2 to 6 volts and 7 to 12 volts
- Heavy duty starter
- Magnetically balanced germanium junctions
- Push button, overload restarter
- Complete corrosion-proof protection
- Compact, space-saving cabinet design

POWERTRON by H-VW-M

—completely new series of germanium rectifiers. These new power-packs supplement H-VW-M's line of germanium rectifiers—equipment that has proved unusually successful in plating plants across America.

Powertron incorporates this time-tested performance, long life and efficiency into a single unit. With simple and dependable controls, Powertron—in the designed ratings and range—more than meets the demands of cost-minded plating shops.

At new low prices, completely self-contained Powertron germanium rectifiers are available for immediate delivery from H-VW-M, Matawan, N. J.

2500 ampere Powertron

1500 ampere Powertron

750 ampere Powertron

GERMANIUM RECTIFIERS

plating problems

POWERTRON SPECIFICATIONS ASSURE LONG LIFE

GERMANIUM JUNCTION DIODES:

All diodes of heavy heat-sink fin construction, air-cooled. Peak inverse voltages are unusually high. Because each junction is conservatively rated, long and efficient operation is assured.

Parallel-free construction
Three vari-sized junctions, used in the design of the 750, 1500 and 2500 ampere units, entirely eliminate any paralleling. In the 5000 ampere Powertron, equal current distribution across each junction is assured through magnetic balancing.

ELECTRO-MAGNETIC OVERLOAD PROTECTION

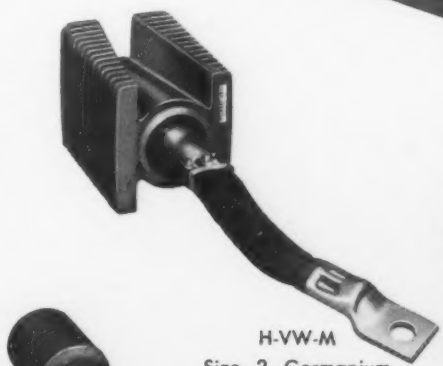
A superior H-VW-M system protects the entire rectifier and eliminates all fuses.

Long-life magnetic cores and relays, unaffected by heat, protect the Powertron against external short circuits, internal failures and all overloads.

No time is lost after automatic cut-offs: pressing "START" button restarts Powertron instantly.

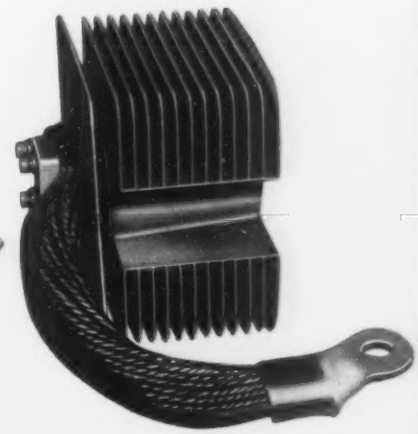
VOLTAGE CONTROL

The widest range of close voltage control—44 degrees of adjustment from 2 to 6 volts and 7 to 12 volts—comes from a system of three tap switches, plus a high-low voltage level switch.



H-VW-M
Size 2 Germanium
Diode

H-VW-M
Size 1 Germanium
Diode

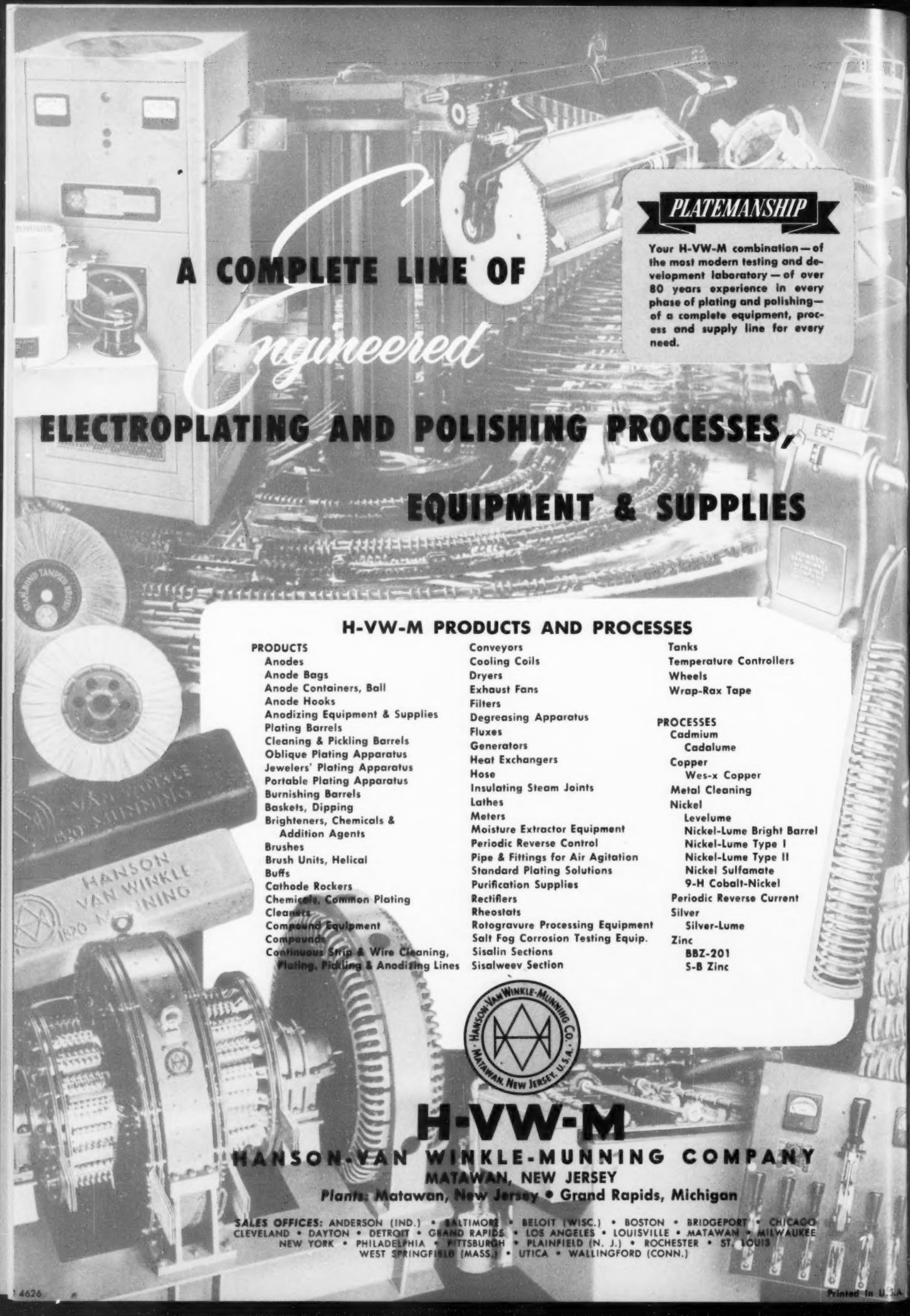


H-VW-M
Size 3 Germanium
Diode

RATINGS AND SPECIFICATIONS

750 amperes	2-12 volts	42" h x 22" w x 20" d
1500 amperes	2-12 volts	60" h x 24" w x 24" d
2500 amperes	2-12 volts	66" h x 33" w x 24" d
5000 amperes*	2-12 volts	68" h x 43" w x 43" d

*can be supplied with motor operated tap switch controlled by remote push-button.



A COMPLETE LINE OF *Engineered* ELECTROPLATING AND POLISHING PROCESSES, EQUIPMENT & SUPPLIES

PLATEMANSHIP

Your H-VW-M combination — of the most modern testing and development laboratory — of over 80 years experience in every phase of plating and polishing — of a complete equipment, process and supply line for every need.

H-VW-M PRODUCTS AND PROCESSES

PRODUCTS

- Anodes
- Anode Bags
- Anode Containers, Ball
- Anode Hooks
- Anodizing Equipment & Supplies
- Plating Barrels
- Cleaning & Pickling Barrels
- Oblique Plating Apparatus
- Jewelers' Plating Apparatus
- Portable Plating Apparatus
- Burnishing Barrels
- Baskets, Dipping
- Brighteners, Chemicals & Addition Agents
- Brushes
- Brush Units, Helical
- Buffs
- Cathode Rockers
- Chemicals, Common Plating
- Cleaners
- Compound Equipment
- Compounds
- Continuous Strip & Wire Cleaning, Plating, Pickling & Anodizing Lines
- Conveyors
- Cooling Coils
- Dryers
- Exhaust Fans
- Filters
- Degreasing Apparatus
- Fluxes
- Generators
- Heat Exchangers
- Hose
- Insulating Steam Joints
- Lathes
- Meters
- Moisture Extractor Equipment
- Periodic Reverse Control
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- Standard Plating Solutions
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- Salt Fog Corrosion Testing Equip.
- Sisalin Sections
- Sisalweev Section
- Tanks
- Temperature Controllers
- Wheels
- Wrap-Rax Tape

PROCESSES

- Cadmium
  - Cadalume
- Copper
  - Wes-x Copper
- Metal Cleaning
- Nickel
  - Levelume
  - Nickel-Lume Bright Barrel
  - Nickel-Lume Type I
  - Nickel-Lume Type II
  - Nickel Sulfamate
  - 9-H Cobalt-Nickel
- Periodic Reverse Current
- Silver
  - Silver-Lume
- Zinc
  - BBZ-201
  - S-B Zinc

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H-VW-M

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MATAWAN, NEW JERSEY

***Plants:* Matawan, New Jersey • Grand Rapids, Michigan**

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14626

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has been very diversified, including the high production appliance field, Mr. Alexander has made notable contributions in the plastics buffing field with respect to improved methods and techniques.

Beckman Expands Fullerton Plant

The *Scientific Instruments Division* of *Beckman Instruments, Inc.* has announced plans for a new $1,500,000 research and development building which will add 100,000 square feet of working area to the present division plant and corporate headquarters in Fullerton.

Construction of the unit, scheduled for completion October 1, will permit expansion of the employee force from 1000 to between 1500 and 1700 persons. It will bring to 304,000 square feet the total operating floor space on the 40-acre Beckman site at 2500 Fullerton Road.

Koelble Staff Assistant for Pennsalt Corrosion Products

Fred Koelble has been named staff assistant for *Pennsalt Chemicals' Corrosion Engineering Products Dept.* In this capacity he will assist sales manager *Robert R. Pierce* in the handling of orders, quotations and specifications on the firm's line of acid proof cements.

Mr. Koelble was a member of the sales staff of Ralph V. Rulon, Inc. prior to joining Pennsalt.

Oakite Announces New Assignments for Service Representatives

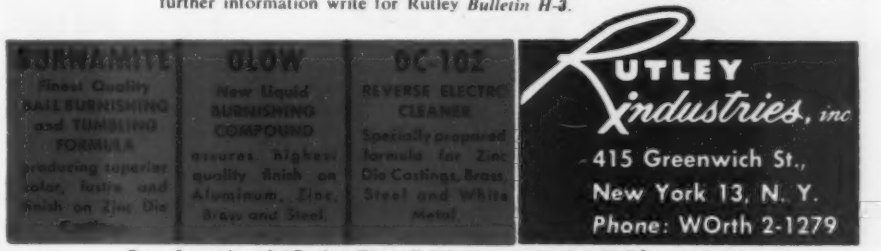
Oakite Products, Inc., manufacturers of industrial cleaning and metal treating compounds, has announced two changes in its nationwide field service organization. *E. Lacy*, for many years a member of the company's Detroit staff, has been transferred to Houston, Tex. *John C. Ruttle*, a member of the Society of Die Cast Engineers, will serve the metal industries in western Detroit. Mr. Ruttle recently completed an intensive eight-week training program at the firm's New York headquarters and in the field.

Protection...
where it's needed most!

RUTLEY BURNISHING • TUMBLING and CLEANING COMPOUNDS

On the finishing line protection *against* unnecessary lost time, excessive rejects, and quality variations is vital for low cost, high efficiency finishing. This is why more and more progressive manufacturers are turning to Rutley *specialized* metal cleaning, burnishing and tumbling compounds. They cost less because they do their work so well.

If you have a special problem why not let a Rutley technician help you solve it. For further information write for Rutley *Bulletin H-3*.



One of a series of "Rutley-Toons." 8½x11 reproduction FREE on request.

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E. Lacy

John C. Ruttle

Holcombe Named District Manager for Pfaudler Co.

Dewey R. Holcombe has been named district sales manager of the New York City area for *The Pfaudler Co.* of Rochester, N. Y., according to a recent

Dewey R. Holcombe

announcement. He has been a member of the sales force since 1946. He joined the New York sales force in 1956.

A native of Rochester, N. Y., Holcombe holds a B.S. degree in Business Administration from Syracuse University and has done graduate work in chemistry at Western Reserve University. Prior to joining the firm he served as a flight leader, 12th Air Force. He is a member of the Sigma Chi fraternity, University Club of Detroit, and the Michigan Dairy Boosters.

Turco Appoints Dr. Newman

Appointment of *Dr. Kenneth W. Newman* to the position of chief process engineer has been announced by *Turco Products, Inc.*, manufacturer of specialized industrial chemical processing compounds.

The Process Division functions as a liaison between the sales and technical departments and Newman's first undertaking, according to officials of the Los Angeles firm, will be to reorganize the division to give even greater technical service in the field. He has been with the firm for three and one-half years — first as a process engineer and later as supervisor of the Research Division. He was formerly manager of United Sterling Corp.'s technical department.

Newman received his Bachelor of Chemical Engineering degree at the Cooper Union, N.Y.C. He received his PhD. in chemistry from Columbia University. He is a member of the American Chemical Society and a Fellow

Dr. Kenneth W. Newman

of the American Institute of Chemists. He also holds memberships in the Society of Chemical Industry, the Chemists Club and the Society of Aircraft and Materials Process Engineers.

Diamond Alkali Appoints Wheeler

Charles W. Wheeler, of Glenview, Ill., has been appointed to manage solvent sales for the *Chlorinated Prod-*

McKeon's

Zinc-Brite

TRADE MARK REG'D.

Top-quality, low-cost

ZINC SOLUTION PURIFIER

Eliminates heavy metal impurities, including copper. Prevents harmful build-up of carbonates.

A complete cleansing treatment: — No other purification measures necessary.

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228 McKeon Way
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Charles W. Wheeler

ucts Division of *Diamond Alkali Co.*, Cleveland Ohio. At his new post, he will be responsible for sales of solvents, including perchlorethylene, carbon tetrachloride, ethylene dichloride, fire extinguisher fluid, chloroform, methyl chloride and methylene chloride.

Wheeler comes to the organization from the Parker Rust Proof Co., Detroit, Mich. He has been assistant regional manager for the firm in Chicago for the past 10 years. Previously, from 1940 to 1944, he was an analytical chemist with Electro-Metallurgical Co. at Niagara Falls, New York.

A World War II veteran, having served in the U. S. Navy in 1943 and 1944 as chemical warfare and desk officer abroad the USS Chicago, Wheeler holds an A. B. degree in chemistry from Denison University, Granville, O.

Sarco Announces New Location in San Francisco

The San Francisco office of *Sarco Company, Inc.* and *Sarcotherm Controls, Inc.* moved its office and warehouse to new and larger quarters at 1485 Bayshore Blvd. *J. Spear* is manager of this branch office.

Pangborn Appoints Hall

Pangborn Corp., Hagerstown, Md., manufacturers of blast cleaning dust control equipment has announced the appointment of *Robert G. Hall* as blast descaling representative. In his new position, Hall will work on all industrial descaling applications as well as

Robert G. Hall

special steel mill equipment for mill roll blasting, ingot mold cleaning and other steel mill processes.

A graduate of the University of Pennsylvania, Mr. Hall was associated with Minnesota Mining and Manufacturing Co. for the past 20 years, as a specialist on finishing steel with coated abrasives. From his headquarters in Hagerstown, Mr. Hall will work with

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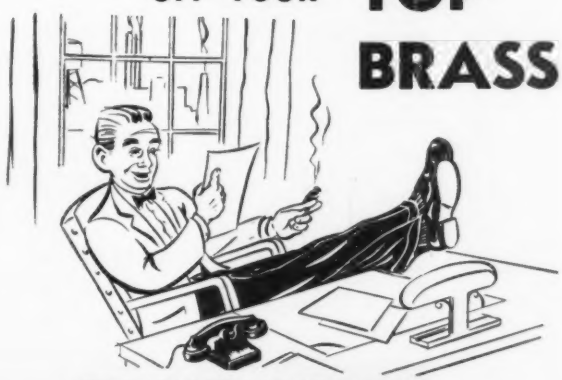

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Trouble Free — Low Cost
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Ready To Use — Just Add Water
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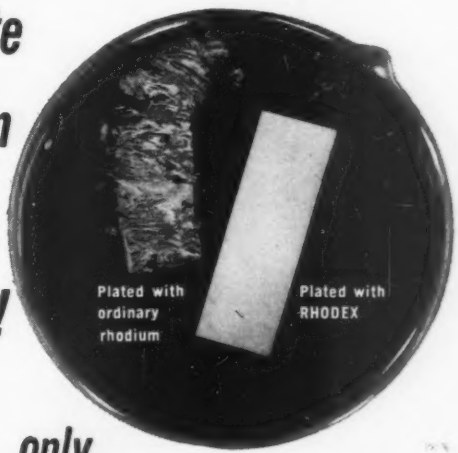

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produces compressively stressed deposits

assuring crack-free, peel-free service. Here's proof! The photograph demonstrates the high tensile stress of conventional rhodium electroplate and the CS of RHODEX. Dissolving the basic metal caused the conventional rhodium electroplate to disintegrate into small crystalline flakes. The Sel-Rex RHODEX electroplate remained unimpaired, and in a continuous film. RHODEX does not peel or crack regardless of thickness! Write for details.

Precious Metals Division
Sel-Rex® **SEL-REX CORPORATION**
155 Manchester Place, Newark, N. J. MF-3

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the nation-wide network of district offices.

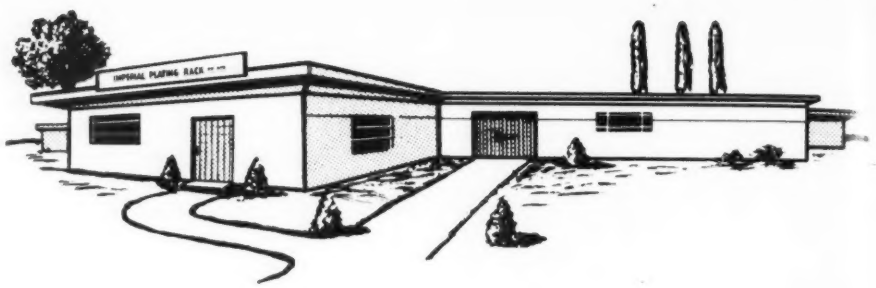
Bixby Named to Pennsalt Marketing Post

Arthur F. Bixby has been named manager of marketing research for *Pennsalt Chemicals' Industrial Division*. Under the director of marketing, *George R. Lawson*, Mr. Bixby will supervise product managers and direct market development on the company's heavy chemicals and "Sharples" brand specialties.

Prior to his promotion, Mr. Bixby was general manager of agricultural chemicals for the Western Division at their headquarters in Tacoma, Wash. A graduate of Massachusetts State College, he joined the firm in 1938 as assistant to the director of heavy chemical sales.

New Canadian Subsidiary Added by Imperial Rack

To better serve the expanding Canadian market, *Imperial Rack Co.* of Flint, Mich., announced the opening of a new Canadian plant to supply engineered racks, fixtures, and accessories to the plating and material handling industry.

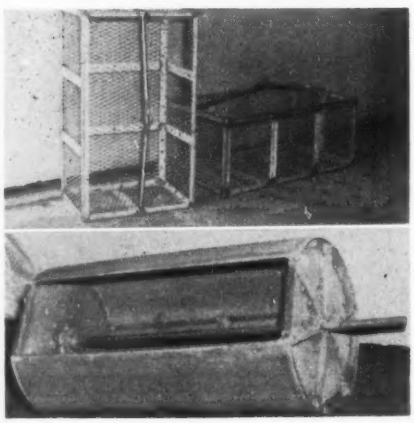


The new *Canadian Imperial Rack Co.* has been located in a modern low one-story building on Oxford St., East, in London, Ont. The entire plant has been renovated so that all phases of rack manufacture can be handled within its plant. Their complete facilities include the latest equipment for manufacture of plating and anodizing racks, even of large capacity now used in automation. Racks can also be supplied completely insulated with Naraco 300 Brown Plastisol coatings which prevent corrosion, damage, or rejection.

Dr. Zay Jeffries Re-Elected at Battelle

Dr. Zay Jeffries, noted metals scientist and retired vice president of the General Electric Co., has been re-elected chairman of the board of trustees of *Battelle Institute*, Columbus, Ohio. Along with Jeffries, seven other officials were elected at the board's annual meeting which closed out one of the most expansive 12-month periods in the Institute's 27-year history.

In addition to election of officers, the board reviewed plans for two previously approved buildings to be constructed at its Columbus site, au-



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That's what Stortswelding means—welds that outwear, outpull and outlive the parts they join. You profit from smooth, efficient, uninterrupted operation and lower maintenance costs. Make STORTS your source for made-to-order material handling equipment.

STORTS WELDING COMPANY INCORPORATED

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MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

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thorized purchase of additional land near the nuclear research center, planned extension of an educational program set up for staff members, and acted to broaden the management responsibilities of officers.

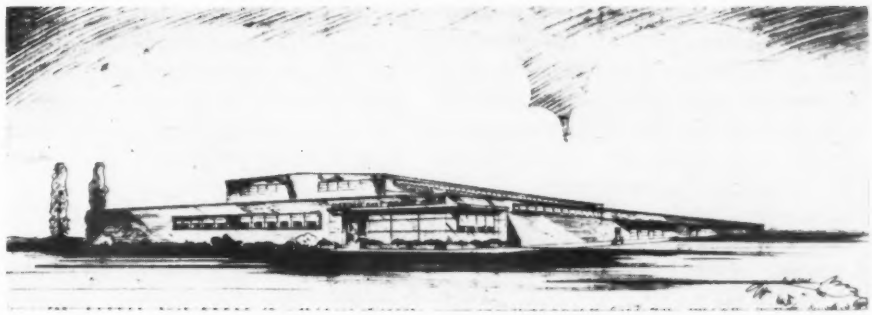
Gordon Elected Executive Vice-President of International Nickel of Canada

J. Roy Gordon has been elected executive vice-president of *The International Nickel Co. of Canada, Ltd.* He has also been elected executive vice-president of *The International Nickel Co., Inc.*, the company's United States subsidiary.

He has been a vice-president of the Canadian company since June, 1953, and of the American firm since January, 1955.

Mr. Gordon graduated from Queen's University in 1920 with the degree of Bachelor of Science in Chemistry. He served as research metallurgist with M. J. O'Brien, Ltd., from 1920 to 1929, and from 1929 to 1936 he was with the Ontario Research Foundation at Toronto, in the later years as its assistant director of metallurgy.

Parker Adds Manufacturing Plant



Parker Rust Proof Co.'s sixth manufacturing plant is now being bulit in St. Louis, Mo., and will be in full operation by next June. The new plant, which is to have an area of 40,000 square feet, is located on a 3⅓ acre tract which will provide room for adequate parking and future plant expansion.

In addition to air-conditioned office space and locker rooms, the plant will house manufacturing facilities and warehouse space for the line of products for surface treatment of metals.

Becco Promotes Noonan, Bretschger, Roth

Several promotions and a number of new assignments within the sales department of *Becco Chemical Division, Food Machinery and Chem. Corp.*, Buffalo, N. Y., have just been announced.

Matthew A. Noonan, since 1946 manager of the Philadelphia territory, has been promoted to New York district manager, and will now have charge of both the Philadelphia and the New York territories which are being consolidated. Mr. Noonan came to the firm in 1936 as a member of the

AUTOMATIC AND SEMI-AUTOMATIC MACHINES

POLISHING • DEBURRING • WIRE BRUSHING
BUFFING • ABRASIVE BELT GRINDING

If you perform any of the above operations on work that can be chucked, it will pay you to investigate our line of equipment.

Shown at left is a model designed to handle articles from 6" dia. x 1¼" long to 3" dia. x 5' long where high production is a must.

Type K2

Send samples of work for recommendations.

AUTOMATIC BUFFING MACHINE CO.
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FOR EXTREME FLEXIBILITY with NON-FRAYING, LONG WEAR
FOR HIGH COLOR PLUS GOOD, SOFT-CUTTING ACTION
CENTERLESS (UNSEWED) UNIT CLOTH BUFF
for more keys to GREATER BUFFING OUTPUT
See pages 8, 94, 100, 108
AMERICAN BUFF COMPANY
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Metropolitan Distributors
HANSON-VAN WINKLE-MUNNING CO.

Complete Service for Metal Finishing
Products Listed Below Available in New York Stock With Reasonable Exceptions

GENERATORS

Anodes, All Kinds	Tallow	Nickel Salts
Brushes	Rouge	Copper Salts
Buffs	Emery Paste	Cyanide
Chemicals	Cleaners	Tanks, All Kinds
Tripoli Comp.	Emery	Plating Barrels
Acme White Finish	Glue	Polishing Wheels
		Polishing Lathes

195 LAFAYETTE ST., COR. BROOME
Phone CAnal 6-3956-7 NEW YORK 12, N. Y.

FILTERS

MAIZO Drying Materials
LEA Buffing & Polishing PRODUCTS

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research department.

Paul U. Bretschger, who has been a field representative in the Western New York territory, has been promoted to manager of this territory, which has now been enlarged to include not only upstate New York but also western Pennsylvania, formerly part of the Philadelphia territory. Mr. Bretschger is a graduate of Cornell and joined the Company in 1949.

Edward M. Roth has been appointed assistant New York manager, to share the expanded responsibilities of Mr. Noonan. A graduate of Canisius College, Mr. Roth joined the research department in 1948 and was assigned to the New York territory as a field representative in March, 1955.

George J. Motz, a graduate of Texas A.&M., has been added to the New York sales staff, and *Eugene M. McMahon*, a graduate of St. Peter's College, and a recent sales trainee, has been assigned as a field representative in the Philadelphia area.

Richard T. Mould, another recent sales trainee, has been appointed to the Midwest district sales staff in Chicago. A graduate of Tri-State College, he joined the firm in 1955.

Bruce J. Bishop, a graduate of Clemson College, has joined the sales organization and is currently assigned to the Southern territory office in Charlotte, N. C.

Thrasher Promoted by Seymour

Howard S. Thrasher has been promoted to general sales manager of *The Seymour Mfg. Co.*, Seymour, Conn., in one of five personnel changes announced by the company.

With *Adolph W. Grele*, simultaneously named assistant sales manager, Thrasher will supervise selling activities both for the nonferrous metal producing company and its wholly-owned subsidiary, The Phosphor Bronze Corp. For 10 years prior to his present appointment, Thrasher was general sales manager and secretary of Phosphor Bronze only.

W. C. Shattuck has been named special sales representative in the New York headquarters. From 1955 until joining Seymour, he was assistant to the president of Pennwoven, Inc. Previously, he was product sales manager of General Cable Corp., New York, from 1950 to 1955. Shattuck, a graduate of Brown University and Columbia Law School, has wide experience in the application and use of nonferrous alloys.

Two other executive changes were announced. *Philip L. Thompson*, formerly assistant purchasing agent for the company and its subsidiary, has been named purchasing agent, replacing *W. O. Bennett* who resigned.

Nopco Names Sandor Head of New Department

Nopco Chemical Co. has announced the appointment of *Michael Sandor* as technical manager of the newly-formed Metal Processing Chemicals Department.

The new department, under Mr. Sandor, will be concerned with the development and sales of chemical processing compounds useful to the metal and metal working industries.

A graduate of the Newark College of Engineering with a degree in chemical engineering, Mr. Sandor has been

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since 4A 1923

STOP CLEANING WORRIES with HARRISON'S NEW EASY WASH COMPOUND

Complete Line of Polishing, Buffing and Deburring Compounds made to wash in Water Solutions, in place of expensive Degreasing Solutions.

Write For Samples

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Have Representative Call.

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HAVERHILL, MASSACHUSETTS

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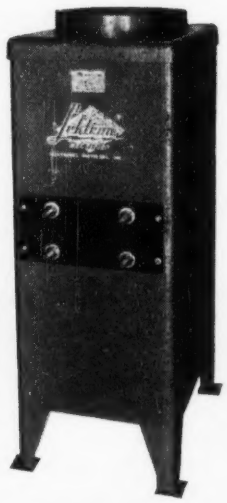
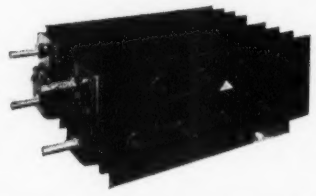
BUY Lektron® RECTIFIER For the Finest in PLATING RECTIFIERS

A BETTER SOURCE OF DC POWER — MORE FOR YOUR MONEY

★ Operate from —40° to 225° F.
★ 50 to 50,000 Amperes DC
★ Built-in Voltage Regulator and Meters
★ Heavy Duty Transformers, Husky Fans

Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.





Replacement Rectifier Stacks for Lektron or Udylite-Mallory

Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts D.C. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

SOME JOBBERS AND SALES TERRITORIES OPEN

ELECTRONIC RECTIFIERS, INC.

2102 SPANN AVENUE INDIANAPOLIS 3, INDIANA

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associated with the metal processing field for the past nine years.

Carborundum to Build New Plant in Ohio

The Carborundum Co. will build a new multi-million dollar plant in Van Wert, Ohio for the manufacture of high volume, small abrasive wheels, according to an announcement. The new plant is part of the company's $30,000,000 modernization and expansion program scheduled for 1957 and '58.

At the Van Wert plant the *Bonded Abrasives Division* of the company will manufacture small vitrified abrasive wheels up to 14 inches in diameter, sold in large volume, that are adapted to automatic production methods. The plant, approximately 3 years in the engineering and designing stage, will provide for many automatic processes, with orderly flow of materials from abrasive mix, through molding, firing, finishing, testing, and shipping.

The single ground floor structure will be 440 ft. x 160 ft., with one side extension for a battery of kilns and another extension for offices, and will encompass a total of 91,000 sq. ft. of floor space. The building is scheduled for completion in late 1957 and for full operation by the end of 1958.

3M Distributors Add to Line

In an expansion program that will offer to industry a complete selection of barrel finishing equipment and supplies at a single source, distributors of "Honite" brand barrel finishing materials have added the lines of four major equipment manufacturers, according to *Minnesota Mining and Manufacturing Co.*, St. Paul. The company said it is coordinating its distributor expansion in an effort to help other manufacturers market advanced barrel finishing equipment, and that new lines and products would be included as they are field-proved.

Technical service will be supplied by all of the manufacturers concerned, as well as a highly trained corps of 3M field engineers who are familiar with the operation of all of the equipment lines, and who have intimate knowledge of their own media and compounds.

Twenty-two distributors located in major metalworking centers across the country will handle, in addition to their 3M products, equipment made by:

Speed-D-Burr Corp., Glendale, Calif. makers of the Mitey-Mite line of barrel finishing equipment.

Metal Finish, Inc., Newark, N. J., makers of an established east coast equipment line now being marketed nationally for the first time.

Rampe Mfg. Co., Cleveland, Ohio, makers of low-cost, precision-built, small capacity equipment.

Crown Rheostat and Supply Co., Chicago, builders of modern barrel finishing equipment for the application of abrasive chips to barrel finishing.

Research Partnership Formed

Formation of a research partnership between *Ionics, Incorporated*, of Cambridge, Massachusetts, and *Diamond Alkali Company*, Cleveland, Ohio was announced recently. Ionics is a leader in the field of research and develop-

BISON CORPORATION

BUFFS

Precision manufactured on latest, modern equipment in the BISON Canton plant — assuring uniform quality.

Air-cooled VENTEX buffs, with permanent or removable metal centers are available for every job!

BUFFS • CLEANERS
COATED ABRASIVES
POLISHING WHEELS
ANODES • HEAT
TREATING PRODUCTS
EQUIPMENT AND
SUPPLIES • COMPOSITIONS

COMPLETE SERVICE FOR METAL FINISHING

Distributors, jobbers! Territories open! Write for details!

Bison Corporation

1933 ALLEN AVENUE S. E. • CANTON, OHIO

• INDUSTRIAL CHEMICALS •
• ACIDS • SOLVENTS • ALKALIES

WAREHOUSE STOCKS OR TRUCKLOADS DIRECT

PHONE GL 5-0284

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A barrel load of bright nickel with a nickel's worth of

NICKELITE

CORROSION RESISTANCE UP 30% TO 100%

With Nickelite you can get 13 to 22 hours of salt spray exposure with 0.00006 inch of barrel nickel, instead of 11 to 13 hours. Actual salt spray tests show even greater improvement with thicker deposits. And you're saving money, too!

WRITE FOR FREE FOLDER ON MODERN BARREL PROCESSES

Plater's Research Corporation

Concentrated to quadruple strength — you don't ship, store or handle water! Shipping weight cut 275% — no deposits, no carboy returns. Stable, efficient, easily stored, easily used — a capful of Nickelite is enough for a barrel load of nickel.

59 E. 4TH ST. • NEW YORK 3

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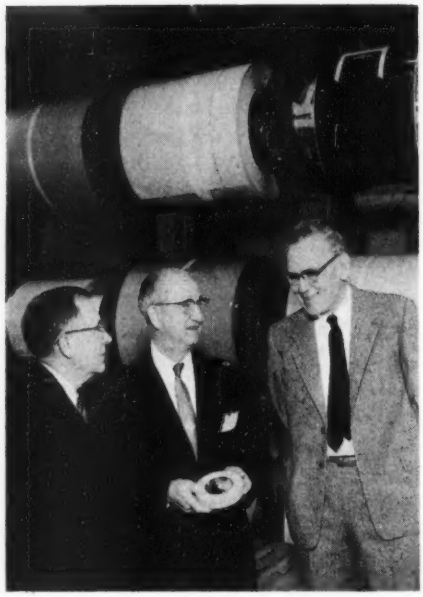
ment of various chemical processes, especially those concerned with application of ion exchange techniques to the modification, concentration or removal of salts from solution.

It will continue independently to pursue its interests in the fields of water conditioning and other already established activities to promote ion exchange membranes. In addition, the Massachusetts research organization is expected to continue its work with the Atomic Energy Commission and certain other private groups.

Out of This World

Tape enough to reach the moon 236 times is represented by the two billionth commercial size roll of tape produced recently by *Minnesota Mining and Mfg. Co.*, St. Paul, Minn. Shown with the symbolic roll are three of the key men in the growth of the tape industry — (left to right) *W. L. McKnight*, board chairman; *H. P. Buetow*, president, and *R. G. Drew*, inventor of the first pressure sensitive tape. The company said the two billionth roll would be packed in a standard shipping carton and routed through regular distribution channels. The recipient will be awarded 10 shares of 3M common stock.



Eighth Rust-Oleum Plant Expansion Program in Decade

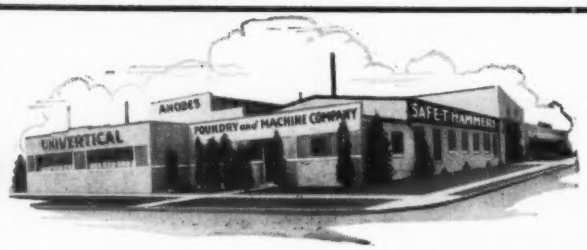
The recently-completed $500,000.00 addition to the *Rust-Oleum Corp.* plant, located on twelve acres at 2425 Oakton St. in suburban Evanston, Ill., marks the eighth company expansion project within the past ten years for the rust-preventive manufacturer. Completely air conditioned throughout, the newest plant addition includes 11,000 square feet of office space in the administrative buildings and 10,560 square feet of space added to the manufacturing plants, bringing the total under-roof square footage to nearly 100,000 square feet.

Pennsalt Metal Processing Sales Staff Holds Annual Convention

Pennsalt Chemical's Metal Processing Department held a three-day sales seminar at Seaview Country Club in Absecon, N. J. beginning January 29. Fifty members of the chemical company's sales, research and executive staffs attended the meeting including field sales and product managers from all areas of the United States and from Canada.

Metal Processing sales manager *John M. Davidson* directed a program of panel discussions, sales clinics and introduction of new products.

SUPER MARKET for ANODES



buy DIRECT from METAL CONVERTER!

Nickel anodes up to 93 inches in length . . . of the highest purity. Density of anodes is at a maximum. Longer life in plating bath.

NICKEL RECASTING PRICE SCHEDULE

ANY QUANTITY only 99+ purity accepted

15c PER POUND FOB UNIVERTICAL

Laboratory Controlled

Write or wire for best price and delivery on the following Anodes:

Copper-Electro Deposited	Phos. Copper
Copper-Cast Round 3" Dia.	White Brass
Copper-Cast Round 2½" Dia.	Zinc
Copper-Cast Beehives	Tin
Copper-Cast Balls	Lead
Copper-Forged Balls	Carbon
Copper-Rolled Oval 1½" x 3"	

UNIVERTICAL

FOUNDRY AND MACHINE COMPANY

SINCE 1939

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PROMAT

PROGLO 100

A full bright cyanide zinc addition agent in powder form for barrel, still, semi, and full automatic plating solutions. In the interests of your economy and better product results, let us prove to you what PROGLO 100 will do for you. For free technical information, write us today.

PROMAT A DIVISION OF POOR & CO.

851 S. MARKET STREET • WAUKEGAN, ILLINOIS

"PROMAT MEANS PROTECTIVE MATERIALS"

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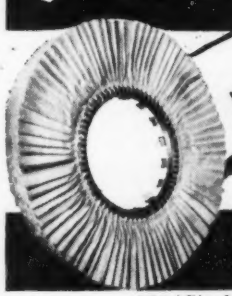
INVESTIGATE THESE

7 keys TO GREATER BUFFING OUTPUT



CUT COSTS!

CUT FINISHING TIME!

BOOST YOUR PROFITS!

AMERICAN BUFF COMPANY

2414 South LaSalle Street Chicago 16, Illinois

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Diversey Announces New Sales Management Changes

A number of changes in the national sales management of *The Diversey Corp.* have been announced. Heading the list of executive changes is the appointment of *R. C. Perry* as the new general sales manager, succeeding *B. B. Button*, who was made vice president of sales on January 1. Perry, formerly Pacific Division manager, has been with the company for 15 years.

Three new positions in the field management structure have been created by splitting the Eastern, Pacific and Southern Divisions. Eastern regional manager is *J. M. Sharp; J. K. Bradford, Jr.*, is now Southern regional manager, and *J. R. McBrien* has been transferred to the Pacific Coast as Pacific regional manager. Mr. Sharp's new region is comprised of the New England Division, directed from Boston by *F. E. Hartig*, and the Eastern Division headed by *H. J. Lisbeth* in Newark.

The Southern Region, guided by Mr. Bradford, has been formed from

R. C. Perry

the present Southwestern Division under *H. B. Conrad*, plus the Southern Division directed by *W. G. Rainey*, who has been appointed division manager.

Two new divisions have been created to form the Pacific Region. The Southern Pacific Division, with headquarters in Los Angeles, is under the supervision of new division manager *F. G. Morgan*. *Frank Berus* heads the Northern Pacific Division from San Francisco.

R. C. Cheek, formerly a Pacific Division district manager, now directs the North Central Division, succeeding McBrien.

Four new appointments as district managers also were announced. *W. D. Funston* is the new district manager in the Pacific Northwest. In San Francisco, *Sam K. Smith* heads that district while *J. T. Hardy* directs the Philadelphia district. The Omaha district will be in charge of *Perry Edman*.

Acheson Elects E. G. Clarke as V.-P. and Director

Because of the rapid expansion of European industrial production, which has greatly increased the demand for its products abroad, *Acheson Industries, Inc.*, New York, has created a new position, vice-president in charge of European operations. *Edwin G. Clarke*, formerly managing director of the British affiliate, *Acheson Colloids, Ltd.*, has been elected to the new post.

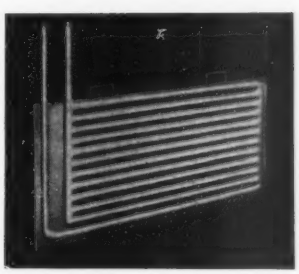
WHEN YOUR PROBLEM IS PIPE COILS

you can usually save much money and be assured of better performance, greater economy, and higher efficiency by using the

DEAN THERMO-PANEL COIL ®

which, actually, is NOT a coil at all. It TAKES THE PLACE of pipe coils. All finishing, plating, and cleaning executives should know the many important advantages of this remarkable Dean device because it costs less, weighs less, requires less space, and in every way is decidedly superior to all old-fashioned methods.

The Dean Thermo-Panel Coil shown here, for example, is commonly used in plating tanks like that illustrated below.



VALUABLE BULLETINS

With these bulletins at your finger tips you can compare the Dean Thermo-Panel Coil with old-type pipe coils at any time. Check the squares, clip out, mail to us with your name, firm name, and address. The data will enable you to solve steam heating as well as cooling problems. If you need help, call on our specialists.

☐ *Bulletin 355 — 52-pages of technical data.*

☐ *Bulletin 257 — Design and price information.*

Backed by 20 Years of Panel Coil Manufacturing.

DEAN THERMO-PANEL COIL DIVISION
DEAN PRODUCTS, INC. 613 Franklin Ave., BROOKLYN 38, N. Y.
Tel. STerling 9-5400

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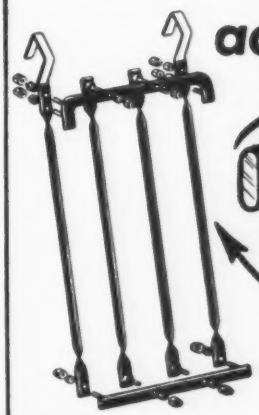
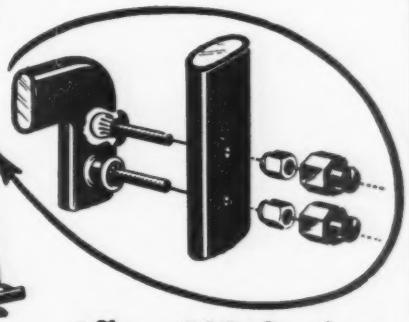
Plating Racks you can adjust to the job





Thinker Boy Racks are assembled from precoated members and tips. BELKE Vac-Seal Assembly seals the joints—only contact tips are exposed to the solution. Racks are easily disassembled without damage to coating.

Available as completely assembled racks or precoated rack members and tips.

Send for literature.

Effect BIG Saving

When Thinker Boy Racks for a certain job are no longer needed you can respace the members or disassemble and use the parts for other racks.

No added investment. Just order Thinker Boys when you buy racks. Instead of ceilings cluttered with no longer needed racks, you'll soon have a supply of Thinker Boy Parts — be able to assemble coated racks of your own design in a matter of minutes. Ask your BELKE Service Engineer or write for details.

Belke MFG. CO., 947 N. Cicero, Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

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E. G. Clarke

Mr. Clarke, who has played an important part in the growth of the British and European business, has also been elected a director of *Acheson Industries, Inc.*

Mr. Clarke, who has been with the Acheson organizations for 35 years, will continue to make his headquarters in London, at 18 Pall Mall, S.W. 1.

Wheelco Establishes Branch Office in Springfield, Ill.

Wheelco Instruments Division of *Barber-Colman Co.*, announces that a branch office has been established at 522 E. Jefferson St., Springfield, Ill., with *LeRoy Peterson* as branch sales manager. The telephone number is 8-5279.

In Indianapolis, the branch office has moved to 1953 Central Ave., Indianapolis 2, Ind. The new telephone number is Walnut 4-2628.

The branch office address at Buffalo has been changed to 2534 Elmwood Ave., Buffalo 17, N. Y. The telephone number is Delaware 9600 and 9601.

The Rock Island branch office has a new address. They are now located at 3710-14th Ave., Rock Island, Ill. The new telephone number is Rock Island 6-3351.

At St. Louis, the branch office address has been changed to 2344 Hampton Ave., St. Louis 10, Mo. The new telephone number is MIssion 5-7958.

Dunning Elected V.-P. of Logo, Inc.

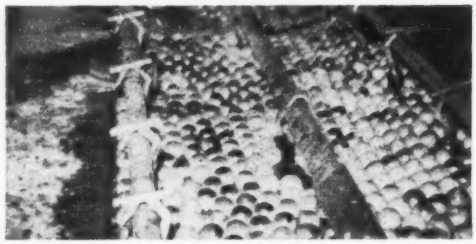
Richard E. Dunning

Richard E. Dunning has been elected vice-president in charge of manufacturing of *Logo, Inc.* He will be responsible for the manufacturing and engineering sections, as well as warehouses.

Mr. Dunning joined the company in

MIST MUZZLES

THESE PLASTO ANTI CHROME SPRAY BALLS
WILL REDUCE
CHROMIC ACID CONSUMPTION UP TO 50%



USE IN CHROME, STRIP AND PICKLE TANKS

- HOLD SPRAY DOWN
- DO NOT DRAG OUT
- DO NOT STICK TO RACK
- KEEP ENTIRE SURFACE COVERED
- KEEP HEAT IN TANK
- LAST INDEFINITELY

55 BALLS PER SQUARE FOOT OF SURFACE.
PRICE — $100 PER THOUSAND

W. D. FORBES CO.
129 - 6th AVE. S.E. MINNEAPOLIS, MINN.

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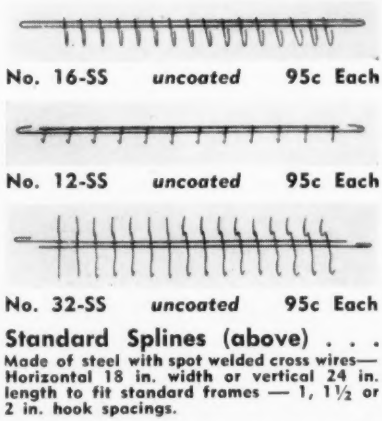
A COMPLETE LINE OF . . .
PPI PLATING RACKS



No. 16-SS *uncoated* 95c Each
No. 12-SS *uncoated* 95c Each
No. 32-SS *uncoated* 95c Each

Standard Splines (above) . . .
Made of steel with spot welded cross wires—Horizontal 18 in. width or vertical 24 in. length to fit standard frames — 1, 1½ or 2 in. hook spacings.

Anodizing Racks . . . . . .
All aluminum — 48½ in. length. Ideal for handling small parts — Prongs can easily be bent to hold various sizes and shapes.

No. 58-AR Anodizing Rack $2.50 Ea.

Special Racks Built to Your Specifications

Dependable PPI Products . . .
PLATING RACKS • WIRE BASKETS & WIRE TRAYS • RUBBER DRUM LINERS • ACID CONTAINERS • ANODE HOOKS • UZALL ANODE HOOKS • FIBERGLAS TANKS, DUCTS, & HOODS • ANODE ROD COVERS • PLASTIC COATED DIPPERS & PAILS • PLASTIC PLUGS • STEEL TANKS • STAINLESS STEEL TANKS • LEAD LINED TANKS • PLASTIC LINED TANKS

PLATING PRODUCTS, Inc.
1509 N. WASHINGTON
KOKOMO, INDIANA

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1952 as plant engineer and has been serving as plant manager prior to assuming his new position. He has a B.S. in Chemical Engineering from the University of Wisconsin and, upon graduation in 1949, was a staff engineer with Bjorksten Research Labs. of Madison, Wis.

Fitzgerald Plating Moves to New Location

The *Fitzgerald Plating Co.* is now located at its new plant at 17450 Filer, Detroit, Mich. The building, which has an area of 10,000 sq. ft., is devoted entirely to barrel plating. A complete barrel plating service is offered, including zinc, cadmium, and phosphate coating.

Working on a two-shift operation, a wide variety of parts are plated to a quantity of 75,000 to 100,000 pounds per day.

Brush Electronics Co. Appoints Gaskill

David M. Gaskill has been appointed manager of industrial equipment sales for *Brush Electronics Co.*, a division of *Clevite Corp.*

David M. Gaskill

Gaskill joined the company in 1953 as a salesman of recording instruments and later was made supervisor of textile equipment sales. He received his B.S. degree at Rhode Island School of Design, and is a member of American Society of Tool Engineers, American Society of Quality Control and American Ordnance Association.

Allen Appointed Eastern Chief Tech. Sales Engineer for Federated Metals

Joseph D. Allen, Jr., has been appointed chief technical sales engineer for the Eastern district of *Federated Metals Division, American Smelting and Refining Co.*, according to a recent announcement.

Mr. Allen is widely experienced in all phases of foundry practice and procedure, and has a thorough background in the field of white metal alloys. In his new capacity, he will devote much of his time and effort toward the development of better metallurgical and casting practices in the foundry, die casting and white metal industries.

Mr. Allen holds a B.S. degree from the Missouri School of Mines. After his graduation in 1948, he joined the division as a metallurgical trainee. He has since held various positions in the research department, and has also acted as assistant plant superintendent at the Newark, N. J., plant and as a sales engineer for the past two years.

Engineered for Extra Years of Trouble-Free Operation

WALKER
Selenium Rectifiers

You can't beat Walker Selenium Rectifiers for dependable D.C. regardless of the size of your plating installation.

These outstanding rectifiers are especially designed to give year in, year out service . . . minimum maintenance . . . no moving parts . . . nothing to wear out . . . nothing to get out of adjustment.

You get more for your money when you use Walker Selenium Rectifiers. Get the complete story, today. Write

The Walker Division Norma-Hoffmann Bearings Corporation

THE WALKER DIVISION
NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONNECTICUT

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For ALL Your Metal Finishing Needs Depend on DAVIES

The Southwest's Leading Supplier of Industrial Plating and Polishing

- COATINGS
- CHEMICALS
- PLATING RACKS
- ABRASIVES
- EQUIPMENT
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Supply & Manufacturing Co.
4160 Meramec St. • MOhawk 4-9332 • ST. LOUIS 16

301 N. Market St. • RI 7-5423 • Dallas 1
813 W. 17th St. • BAltimore 1-2128 • Kansas City 8

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Graham, Savage and Associates, Inc.

Dr. A. K. Graham, president, announces that effective March 31, 1957 the corporate name *Graham, Savage & Associates, Inc.* supersedes the former *Graham, Crowley & Associates, Inc.* The change, Dr. Graham states, represents a more active participation of *Frank K. Savage* in the company's consulting, engineering and research activities, following the resignation of *Dr. C. A. Crowley* in 1954. Mr. Savage, who has been vice-president of the firm since 1948 and in charge of the company's Michigan office and pilot plant, Kalamazoo, also becomes a member of the board of directors.

Mr. Savage, who is a past president of the American Electroplaters' Society and long active in work of the Society's research committee, is president and owner of Savage-Rowe Plating Co., Kalamazoo. This company's facilities include the pilot plant activity of Graham, Savage & Associates, Inc. and, to integrate Graham, Savage and Savage-Rowe interest as particularly related to electrochemical research development, Dr. Graham is vice-president of Savage-Rowe Plating Co.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

1957 CONVENTION

The Montreal Convention Committee is busy lining up a fine technical program and, in addition, arranging for the Convention visitors in June to see the sights of the city of Montreal. Located on an island in the St. Lawrence River, Montreal is the second largest French-speaking community in the world and is one of the most interesting cities of North America to visit.

Convention Headquarters will be at the Sheraton-Mount Royal Hotel, which has 1,100 rooms. Other large hotels include the Laurentien, the Windsor and Berkeley. A new very large hotel to be known as the Queen Elizabeth is under construction but will not be ready in time for the A.E.S. Convention.

Mrs. G. R. Davidson
Co-Chairman Ladies Committee

In their spare time the platers will be able to see the many historical sights and religious shrines, as well as find excellent French restaurants within

The New Magic Ingredient
FOR BUFFING COMPOUNDS
TAMART
. . . the name of our new composite abrasive for hard buffing compounds used on non-ferrous metals . . . in laboratory tests and actual use TAMART has proven equal or superior to similar abrasives now in use . . . and of special interest to you, TAMART is far more economical.
DEVELOPED, PRODUCED AND SOLD BY THE MAKERS OF BUFFING COMPOSITION SILICAS
DEPT. RM-23 TAMMS INDUSTRIES, INC., 228 N. La Salle St., Chicago 1, Ill.

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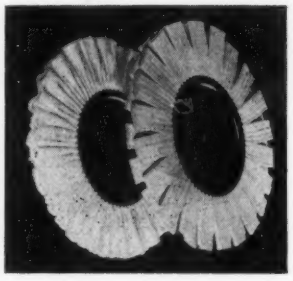
GARFIELD

The ALL-PLUS BUFF
WITH THE NEW, SCIENTIFICALLY DESIGNED STEEL CENTER!
Yes, the *fully ventilated new lathe faced* GARFIELD Buff with the steel center is now yours at no extra cost. The well balanced GARFIELD Buff with *extra* operating coolness at its periphery (where it is needed), will out-last buffs of comparable construction. It all adds up to *superior buffing at lower cost.* We Invite a Trial.
ALSO A COMPLETE LINE OF AIR-COOLED BIAS SISAL AND CLOTH BUFFING WHEELS.
Stocks available in principal cities.
A few choice territories are still open.
GARFIELD BUFF CO.
6 CLINTON ROAD • CALDWELL, N. J.

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easy walking distance of the Headquarters hotel. One unusual point of interest which should not be missed as, to the best of our knowledge, it is the only one in North America is the Wax Museum (Musee Historique Canadien) located one block east of St. Joseph's Shrine at the junction of Queen Mary Road and Cote des Neiges. Another interesting point is the lookout in Mount Royal Park just a few blocks back of the Headquarters hotel.

A program for the ladies is being arranged under the direction of Mesdames G. R. Davidson and J. J. Roche. This will include sight-seeing trips and an opportunity for shopping in the large department and specialty stores along St. Catherine Street. Some of the items which are attractive buys include Scotch woolens, English china, Irish linen, French perfume, Canadian furs, and Quebec handicrafts. Many of these products are brought into Canada under preferential tariffs with the result that the price tag is surprisingly low.

To those who are crossing the border for the first time, it comes as a most pleasant surprise to find the customs and immigration inspectors so friendly and courteous. Formalities for entry into Canada and return to the United States are extremely simple. No passport is required of a United States citizen, and presentation of a Birth Certificate or any other acceptable proof of citizenship is all that is required.

U. S. visitors, returning to the United States after a 48 hour stay in Canada, may take back with them, FREE OF DUTY, articles for personnal or household use to the extent of $200 per person, once every 31 days. (This exemption may include tobacco, cigarettes, foodstuffs). A family travelling together (parents, or parents with minor children) may group their individual exemptions for the purchase of one or more articles for one member of the family.

Visitors should have no misgivings about facilities for obtaining Canadian currency. All the banks in Montreal, and indeed all hotels, are most happy to extend this service without delay or formality, in accordance with the current rate of exchange.

Chicago Branch

The January 11 meeting of the Chicago Branch was designated as "Sustaining Members Night." Representatives of the sustaining members were invited as special guests for dinner and the technical session which followed.

We were priviledged to have as our main speaker, *Dr. Walter Meyer*, of Enthone, Inc., who is both an eminent scientist and a successful businessman.

Dr. Meyer spoke on the subject of the stripping of metallic coatings from various base metals. The methods and solutions for stripping all the usual commercial plating were discussed in detail. The interesting question and answer period which followed was an indication of a job well done. The meeting was concluded with due appreciation for our well-known guest, and his excellent speech.

J. C. Corre,
Publicity Chairman

KER-CHRO-MITE®
for ZINC AND CADMIUM

KER-CHRO-MITE® #4* ⧗⟶

Gives a mirror-like finish to dull-plated work; protects against corrosion, is stain resistant and outperforms other coatings.

KER-CHRO-MITE AL

Produces a yellow chromate conversion coating on pure aluminum or on high silica alloys. Excellent as a base for paint or as a final high resistance finish.

ZIN-K-LUX© (Zinc Brightener)

Produces a lustrous finish (barrel or still) and has excellent throwing power.

CADLUX (Cadmium Brightener)

Brightens (barrel or still), increases plating range and eliminates burning.

® Registered Trade Mark.

KOSMOS

ELECTRO-FINISHING RESEARCH, INC.
140 LIBERTY ST. HACKENSACK, N. J.
Phone: HUbbard 7-8889

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FROM START
SELF PRIMING instant filtration
TO FINISH
Automatic Backwash Reversal Switch

Model LSIN series full view Lucite Filter chamber self-priming SS-316 pump Cap. 50-350 Gal. per hr.

over 25 models designed to fit your needs from 50-3000 gal. per hr.

write for FOLDER

Sethco
FILTER PUMPUNITS

Sethco Mfg. Co., 74 Willoughby St., Bklyn., N. Y. • ULster 5-8940

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Central Michigan Branch

The Central Michigan Branch met for a dinner and program at Hotel Hayes in Jackson, Mich., on Tuesday evening, January 8, 1957.

The business portion, led by President *G. S. Woodruff*, was primarily a discussion of attendance and membership. The speaker of the evening was *C. F. Nixon*, National Past President of the AES, and head of the Electro-Chemistry Department, Research Staff, of the General Motors Corp. Mr. Nixon's subject was "Nickel Conservation," and his talk included a discussion of the newer techniques in nickel plating.

The meeting was concluded with a discussion period and social hour.

Earl D. Creese,
Publicity Secretary

Indianapolis Branch

On January 2, 1957 *Marshal Whitehurst* called the meeting to order at the regular place, for the usual introductions. Thirty one members and guests were present.

Fritz Anderson reported that Tri-State committees were progressing and that they would have another meeting Jan. 5th. *Les Reynolds* reported that Cincinnati Branch is backing all of the Tri-State endeavors and, of course, would like similar cooperation in the future. Tickets have been printed and are turned over to *Bert Hawhee*.

Loren Stevens introduced the color movie "Mining for Nickel" by the courtesy of International Nickel Co. as the educational feature for the evening.

One application for membership was received from *Thornton Glen Gross;* R.R. No. 5, Lafayette, Ind., who works at the Duncan Electric Co. The request was accompanied by the initial fee and requirements. *Les Reynolds* made a motion to accept Mr. Gross, which was seconded by *Edna Rohrabaugh* and the motion carried.

Meeting adjourned 9:25 P.M.

Paul Freeman,
Secretary

New Haven Branch

The regular January meeting was called to order at 8:30 P.M. by president *Austin Jackson*. The roll call of officers was held, showing several officers to be absent among them *B. Gaffney*, secretary-treasurer. The report on the very successful Xmas Party was given by *E. Busby*, chairman of the entertainment committee. President Jackson, gave the report of the last Regional Committee meeting held at the Statler Hotel, Hartford, Conn. The budget was set at this meeting for the 18th Annual Regional to be held on April 27, 1957.

Springfield will be the Host Branch
Hartford will handle the Educational Program
Waterbury will handle the Entertainment
Bridgeport will handle the Program
New Haven will handle the Publicity

The technical chairman, *Harry Taylor*, introduced the speaker of the evening, *A. E. Carlson*, Technical Service, General Chemical Division of Allied Chemical & Dye Corp. Mr. Carlson spoke on "Plating from Fluoborate Solutions." This was a very interesting and educational talk, followed by a question and answer period.

The door prize was donated by *Bill Bridgett*, Hanson-Van Winkle-Munning Co.

The meeting was adjourned at 10:15 P.M.

B. Gaffney,
Sec.-Treas.

Newark Branch

The January 18th meeting of the Newark Branch was held at the Robert Treat Hotel with Vice-President Bittrich as chairman. Three applications were received and *William Hess* of Fedders-Quigan Corp. was elected a member. *R. W. Hess* was transferred from Buffalo to Newark.

D. Foulke reported on the Interim meeting held on January 12th at Pittsburgh which was attended by the three Newark Branch delegates, Messrs. Cobb, Wagner and Foulke, and at which Newark Branch member *Dr. Andrew W. Wesley* was proposed as a candidate for third vice-president of the Society. *Edward Faitt* was present after an illness and thanked the membership for their interest. *Royal Clarke* was reported recuperating at his home.

In the absence of Librarian Carr, *Cy LaManna* substituted, introducing first, *Jack Finn* of Sel-Rex who discussed the maintenance and care of filter pumps. He pointed out the care required for pumps with mechanical or with jam type packing.

Myron B. Diggin, Hanson-Van Winkle-Munning Co., then delivered the principle talk of the evening, "Some Recent Developments in Nickel Plating." He reviewed the improvements in physical properties of bright nickel deposits in recent years and pointed out that plating speeds had also increased. Mr. Diggin showed how good physical properties and improved corrosion resistance could be obtained by use of duplex (80% semi-bright leveling nickel plus 20% bright nickel) coatings applied in either a one-bath or two-bath set-up.

A number of slides showing deposit structure and type of corrosion were shown. The many questions and comments from the audience of 65 who

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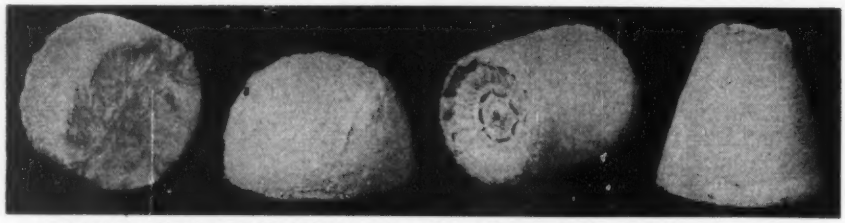

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braved near-zero weather, pointed up the excellence of the talk.

D. Gardner Foulke,
Secretary

Detroit Branch

The January meeting of the Detroit Branch was held in the Sheraton-Cadillac Hotel, Founders' Room on Friday, January 4th, 1957. The meeting opened at 8 p.m. with a film entitled, "Horizons Unlimited."

Howard McAleer, president, officially welcomed the assembled members about 8:20 p.m. Mr. McAleer read a letter from *J. P. Nichols*, executive secretary of the National Society, thanking the Branch for the good time he had at the Annual Christmas party.

Ed Kubis, secretary-treasurer, reported on a letter from the National Society urging every member to fill out the card which will be sent out as a survey of the membership. Ed also introduced to the assembled members seven new members who were promptly voted into the organization. He also announced the dates of the annual parties for the Cleveland and Chicago branches.

Walter Pinner, chairman of the nominating committee, announced the names of the nominees for the coming annual election. The following men were nominated for the following offices:

President — *C. H. Friedt, Jr.*
1st V.-P. — *Manuel Ben.*
2nd V.-P. — *Donald Bigge.*
Secty.-Treas. — *E. J. Kubis.*
Educational Chairman — *J. D. Thomas.*
Board of Mgrs. — *John Siefen.*

Accolades to *Wright Wilson* for the Annual Christmas Party. This was from all reports one of the most successful and entertaining parties to date.

Cleve Nixon, General Motors Research Staff, introduced the speaker of the evening, *Herb Head* of Chrysler Corp. Mr. Head, in his dry Kentucky type humor, gave a very interesting talk on the structure and functions of the National Society.

Patrick J. Driscoll

Saginaw Valley Branch

On January 9, 1957 the first dinner meeting of the new year was held at the Michigan House in Bay City, Mich. at 6:45 P.M.

After a very delightful roast beef dinner, the entire group was invited to a plant tour of the Bay City Division of the Electric Auto-Lite Company.

The tour proved to be very interesting and informative. The bulk of the tour consisted of the plastics 'casting' and anodizing departments. The plastics 'casting' processes used in the manufacture of automotive tail light 'glass' and electrical system housings such as distributor caps, etc. was described in detail by the very congenial supervisors.

The anodizing process was interesting and centered around one very large full automatic machine which was automatically loaded and unloaded and which had other automatic features controlling the process.

The meeting was adjourned as the members completed the tours. They were greeted as they left the plant by a good old Michigan snow storm, which prevented many from returning home that night.

Charles Melekian,
Recording Secretary

The Chemical Institute of Canada

A large group of chemists and chemical engineers and others engaged in kindred activities are expected to attend the 40th annual conference of *The Chemical Institute of Canada*, to be held at The University of British Columbia, Vancouver, B. C., June 3, 4 and 5, 1957.

A feature event of this conference will be the awarding of The Chemical Institute of Canada Medal for 1957, to *H. G. Thode*, principal, Hamilton College, and head, department of chemistry, McMaster University, Hamilton, Ont. This award is presented annually to a chemist or chemical engineer for outstanding contributions to the science of chemistry or chemical engineering.

A. C. Neish, associate research officer, Prairie Regional Laboratory, Saskatoon, Sask. will deliver the annual Merck Lecture on Tuesday, June 4. The Leroy Egerton Westman Memorial Lecture will be presented this year by *J. H. Hildebrand*, department of chemistry, University of California, Berkeley, California.

In addition, technical papers on agricultural chemistry, air pollution, anlytical chemistry, biochemistry, chemical education, chemical engineering, organic and physical chemistry, and protective coatings will be given.

Conference plans also include a number of interesting plant visits, a boat trip, golf tournament, salmon barbecue and a ladies program.

Chicago Electroplaters' Institute

Meeting plans for Chicago Job Shop Association were discussed at January Board Meeting which saw induction of new slate of officers and directors. Shown in photo, (standing, left to right) are: *Herbert E. DeGrenier*, Grand Plating Co., secretary-treasurer; *Ray Crawford*, Riverdale Plating Co., director; (seated, left to right), *Chet J. Kennedy*, American Buffing & Processing Co., vice-chairman; and *Harold*

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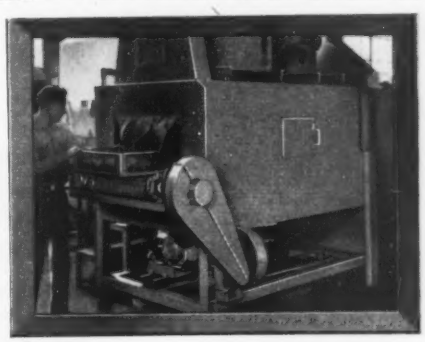

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W. Baker, Electro-Galvanizing Co., chairman. Others elected to board, but not shown in photo are: *John Halliday*, Great Lakes Plating Co., Div. of Great Lakes Industries; *Phil Ritzenthaler*, Plating Engineering Co., West Allis, Wis. and *John Samaras*, C. S. Samaras & Son.

N.A.C.E.

Exhibitions will be held concurrently with meetings of North Central Region and South Central Region and South Central Region, National Association of Corrosion Engineers during October, 1957. Both meetings are to be held October 1-4 inclusive.

M.E.P.A.

The Masters' Electroplating Association of New York announces that it will hold its 39th Annual Banquet at the Plaza Hotel, New York City, on Saturday, May 11, 1957. This is the outstanding event of the year in the industry. Suppliers, job-platers and their friends from all over the U. S. A. look eagerly forward to attending. The Association was formed in 1918 with a few hardy pioneers. It has now grown to almost 100 members in the Metropolitan area. The Association has striven in every way to raise the technical, business, and ethical standards of the Industry. This year the popular *Mariano Ranno*, partner, Imperial Plating Co. of Brooklyn, is the banquet chairman. Mr. Ranno is well-known in the Industry. As chairman of the Nickel Committee of the N.A.M.F. with which Masters' is affiliated, he sparked the year long drive for industry recognition and for the equitable distribution of nickel.

Sal. Novelli of Service Plating Co. is the chairman of the Association, *Jesse Goldman* of Grand Chromium Plating Corp. is vice-chairman, and *Frank Kaiser* of Long Island Mechanical Plating Co. is treasurer.

S. C. Taormina is the Executive Secretary with offices at 59 E. Fourth Street, New York 3, N. Y.

The cocktail hour will start at 6:30 P.M., followed by the banquet, dance, and entertainment. Subscription to the banquet is $25.00 per person—dress optional.

OBITUARY

GEORGE L. NANKERVIS

We were shocked to learn, as we were going to press, of the sudden death of George Nankervis.

Mr. Nankervis, who was 59 years old, was president of the Geo. L. Nankervis Co., Detroit. He was also a past president of the Metal Finishing Suppliers' Association, and a well known member of the American Electroplaters' Society.

George will be missed by his many friends in the industry.

PATENTS

(*Continued from page 75*)

Hull Cell Apparatus

U. S. Patent 2,760,928. *Aug.* 28, 1956. *M. Ceresa.*

In an electroplating apparatus to be employed as a Hull cell a flat base and side walls vertically affixed to the base to form a cell for containing an electrolyte, the base and side walls being made of a resin, at least the side walls being transparent, means in the side walls and base for holding a rectangular flat plate anode member and a rectangular flat plate cathode member vertically in the cell, the bottom edges of the anode member and cathode member being disposable substantially on

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the flat base, the one vertical edge of the anode member than the distance from the other vertical edge of the cathode member to the other vertical edge of the anode member, an open depression in the flat face of the base and a heating element disposed completely within the depression, the electrolyte having free access to the depression whereby on being heated by the heating element the electrolyte circulats throughout the cell volume by convection current flow.

Barrel Finishing Steel

U. S. Patent 2,760,924. *Aug.* 28, 1956. *G. D. Troendly, assignor to The Autoyre Co., Inc.*

The method of treating articles stamped from relatively low carbon steel which consists in carburizing the articles for a period sufficient to provide a continuous carburized layer thereon having a thickness of approximately .005" to .006", quenching the articles to harden said continuous layer, tempering the articles to reduce the hardness of said continuous layer, tumbling the articles together in a tumbling barrel with an abrasive, and thereafter electroplating said articles.

Fused Bath Cleaning

U. S. Patent 2,760,927. *Aug.* 28, 1956. *H. G. Webster, assignor to Kolene Corp.*

A process of cleaning metal comprising fusing a mixture of alkali metal hydroxide in proportion of at least about 75 percent by weight with about 1 to 15 percent by weight of alkali metal borate, suspending the metal to be cleaned in said molten salt bath as an electrode and passing an electric current therethrough.

Electropickling

U. S. Patent 2,760,923. *Aug.* 28, 1956. *L. H. Boguski, assignor to Republic Steel Corp.*

Process for electroplating metal articles comprising the steps of: placing said articles on an electrically conductive rack in positions adjacent consumable electrodes supported on but electrically insulated from said rack; immersing said rack with the consumable electrodes and articles thereon in a pickling bath including an acid effective to remove oxide films from said articles, which acid normally attacks said consumable electrodes; concurrently with said immersion conducting a direct electric current through said rack, said articles, said bath and said consumable electrodes with said articles serving as anodes and said electrodes as cathodes, said reverse current being effective to inhibit corrosion of the electrodes by the acid and to strip from the rack material plated thereon during a preceding plating step; withdrawing the rack with the electrodes and articles thereon from the pickling bath and immersing it in a plating bath; conducting a direct electric current through said consumable electrodes, said plating bath, said articles and said rack with said electrodes serving as anodes and said articles as cathode, said electrodes being electrolytically consumed in said plating bath as a plate is deposited on the articles and on the rack; and withdrawing the rack from the plating bath and unloading the articles therefrom.

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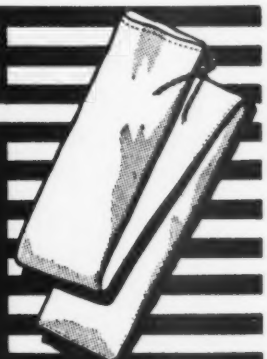

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Conversion Coating

U. S. Patent 2,759,862. *Aug.* 21, 1956. *J. A. Hendricks, assignor to Devex Corp.*

In a process of treating ferrous surfaces to produce an adherent coating thereon for subsequent drawing and deforming, the step of subjecting the ferrous surface to an aqueous bath at from room temperature to approximately 190°F. containing the following ingredients:

	Percent
Oxalic acid	4-15
Sodium acid sulfate	2-5
Sulfur	.5-10
Boric acid	.5-5
Sodium thiosulfate	.5-2.5
Protective colloid	.5-3
Wetting agent stable at low pH values	.01-3

Balance essentially water.

for a period of time long enough to form a substantial adherent, mixed ferrous oxalate and sulfide coating thereon.

Electroless Nickel on Aluminum

U. S. Patent 2,761,792. *Sept.* 4, 1956. *R. D. Wasserman, assignor to Eutectic Welding Alloys Corp.*

A four-step process for preparing aluminum metal parts for soldering, consisting of sequentially treating an aluminum base metal with a magnesium silico halide precleaning and deoxidizing solution, a subsequent autocatalytic contact nickel-plating solution for a period sufficient to deposit a surface film of nickel on the aluminum, a subsequent deoxidizing, fluxing and cleaning rosin-alcohol flux solution, and a final tinning operation with a solder compound.

Plating Rack

U. S. Patent 2,760,929. *Aug.* 28, 1956. *G. A. Shepard and R. C. Avellone, assignors to Republic Steel Corp.*

Electroplating apparatus, comprising a rack to be immersed in an electroplating solution for carrying hollow cathodic articles to be plated during such immersion and cooperating consumable anodes, a plurality of anode supports on said rack, each anode support comprising a vertically upwardly projecting pin having a laterally projecting flange,, a plurality of replaceable anodes, one on each said support, each said anode having an annular bottom surface adapted to rest on said flange in electrical contact therewith and a recess in its bottom surface dimensioned to receive said pin with an easily slidable fit, so that each anode projects freely upwardly from its associated flange and each anode remains on its support and in electrical contact therewith only by the cooperation of said pin and recess and by gravity and as long as the rack is horizontal and is replaceable by lifting it off the support and lowering another in its place, a plurality of supports for hollow articles on said rack, each concentric with one of said anode supports and electrically insulated therefrom, each said hollow article support comprising a plurality of contact bars extending radially with respect to the associated anode support and having upper surfaces cooperating to support in a vertically extending

Plating Rack

U. S. Patent 2,761,831. *Sept.* 4, 1956. *H. C. Luechauer, assignor to General Motors Corp.*

An electroplating apparatus for uniformly plating the concave surfaces of semicylindrical workpieces, an electroplating fixture comprising an elongated base having two substantially parallel edges, one of said two edges extending upwardly and inwardly to provide an elongated niche between said one of said edges and said base, said base including a central longitudinal depressed area forming two spaced shoulders substantially parallel to said edges of said base, extensions on said base providing workpiece stops adjacent a common end of each of said shoulders, said base further having a plurality of longitudinally spaced diamond shaped apertures in said depressed area, the shorter center dimension of said apertures being substantially parallel to and midway between said shoulders, a dome-shaped cover for said base.

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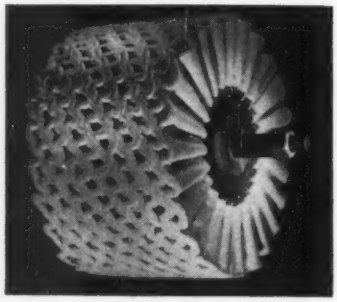

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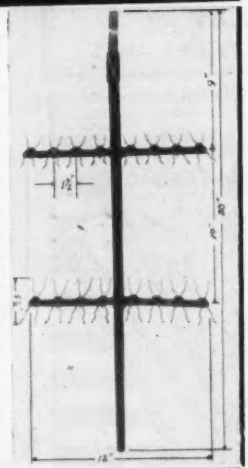

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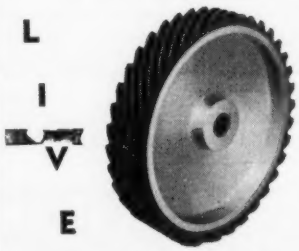

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News from California

By Fred A. Herr

An extensive metal finishing department, including facilities for anodizing, chromating, gold and silver plating, and other processes for finishing wave guides and other precision electronic parts is included in plans for a $6,000,000 electronics factory to be built in Fullerton, Calif., by Hughes Aircraft Co. of Culver City, Calif.

Nickel, chromium, cadmium, and tin, plus the necessary cleaning, polishing, and buffing equipment, are also to be installed in the proposed 30,000 square foot plant which will rise on a 475 acre site. It was announced that a staff of 2,000, the majority of them engineers, scientists, and technicians, will be needed by the end of 1958 for the radar research and assembly of associated products which will center in the new Fullerton plant.

Nathan Robinson took over in January as swing shift foreman of the plating department of the Price-Pfister Co.'s Los Angeles plant. Robinson served as a plater for the U. S. Government in Panama from 1947 to 1950, working on canal machinery parts.

"I never missed reading the 'California News' column in METAL FINISHING throughout my stay in the Canal Zone," Robinson said, "for it kept me in touch with people and activities up in California."

Robinson revealed, incidentally, that *Nathaniel Hall*, technical editor of METAL FINISHING, was instrumental in getting him his first plating foreman job. It happened back in 1939 when Mr. Hall gave him an assist in lining him up with the Simplex Electric Co. in New York City, manufacturers of electric table broilers.

Electrochem Mfg. Co., specialists in hard surfacing of aluminum and hard chromium and hard anodizing, have moved the last of their operations from Burbank to 2124 East 51st St., Vernon, Calif., where some of the firm's activities were transferred a year ago. All of Electrochem's activities are now concentrated in the Vernon building, according to *Dick Golden*, partner. The other partners are *Myron Miller* and *William Fullmer*.

Fred Kietka, well known in plating circles in the middle-west for the past 20 years, has joined the plating staff of Certified Chrome Products in Los Angeles. Kietka was formerly with Lincoln Industries, Damascus, Va., Kuehne Mfg. Co., Mattoon, Ill.; and the C. J. Conn Co., Elkhart, Ind. He is a member of Chicago Branch of the A.E.S., but plans to transfer to Los Angeles Branch in the near future.

Speed-D-Burr Corp. of Glendale, Calif., manufacturers of precision barrel finishing equipment, reports the appointment of the Hallidie Machinery

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Negotiations were completed in mid-January between *Haskell Miller*, Speed-D-Burr president, and *Paul V. Forsythe*, vice-president of the Hallidie organization. The Hallidie Company will offer on-the-spot engineering service from its Seattle main office and branch offices in Portland, Oregon and Spokane, Wash.

West Coast coming events in March are:

March 23: Annual Educational Session and Dinner Dance of Los Angeles Branch, A.E.S., in the Ambassador Hotel.

March 25 to 29: 10th Western Metal Congress in the Ambassador Hotel, and Western Metal Exposition in the Pan Pacific Auditorium, Los Angeles.

A plan is reported to have been approved in January under which Pennsalt Chemicals of Philadelphia, Pa., has taken over Delco Chemicals, Inc., Los Angeles, through an exchange of stock.

Delco Chemicals has its main office and plant in Los Angeles and a recently completed factory in Dallas, Tex. Its major activities are concerned with the manufacture and sale of organic and inorganic specialty cleaning and stripping compounds for the aircraft industry and general maintenance purposes.

Following the completion of details involving transfer of ownership and control, Delco's operations will continue under the direction of its president, *Lyle Harbour*, and vice-president and general manager, *A. F. Slover*. Delco's activities, it was announced, will become an integral part of the Chemical Specialties Division of Pennsalt, under general manager *A. H. Clem*.

The importance of actual solvent evaporation rates as determined by an evaporometer was discussed at the January meeting of the Los Angeles Paint & Varnish Production Club by *J. P. McGuigan* of Shell Chemical Co., and *W. H. Eustis* of Shell Oil Co.

Mr. McGuigan declared that the determination of the actual evaporation rate was of greater importance than the boiling point in the formation of lacquer solvents. Films shown by the speaker depicted the operation of the thin film evaporator, in addition to which tables were presented illustrating the high degree of reproduceability obtained on several tests of the same solvent. Mr. Eustis elaborated on the use of the evaporometer in hydrocarbon solvent formulations.

A proposal was submitted at this meeting to change the Los Angeles part of the local chapter's name to Southern California Paint & Varnish Production Club to give recognition to members of surrounding areas, some of whom come from as far away as Phoenix, Ariz., and San Diego, Calif.

Alert Supply Co. of Los Angeles, exclusive West Coast representatives for Wagner Bros., has announced through general manager *A. D. Gaskin* that it is now handling the western distribution of Wagner Bros.' new Iso-Brite high speed copper. With the final completion of its new modern laboratory in the recently opened new plant at 2041 South Davie Ave., Alert Supply is in position to make all necessary checks and tests for California and Pacific Northwest platers, Mr. Gaskin announced.

Bay State Abrasive Products Co. of Westboro, Mass., has named *John R. Anderson* of South Colby, Wash., as its abrasive engineering representative in the state of Washington and the northern parts of Idaho and Oregon. Mr. Anderson was previously active as a member of the procurement department, Puget Sound Naval Shipyard, as developer of machine tool and plant equipment programs for production department shops.

Trygve Myhren has been appointed by the Harbill Corp. of Los Angeles as chief metallurgist and supervisor of the firm's extensive laboratory facilities. Prior to joining the Harvill organization he served as superintendent of the alloys division of the Kaiser Aluminum & Chemical Corp. in Newark, Ohio.

The Carborundum Company of Niagara Falls, N. Y., has disclosed the appointment of two field sales engineers to its Pacific Coast district staff.

Clifford N. Floyd has joined the staff of the Coated Abrasives Division, covering the Los Angeles area; and *Harold J. Good* in the San Francisco Bay district.

Don L. Abajian resigned recently as advertising manager of the Warren & Baily Co., an industrial supply house, to take over as advertising manager of Anadite, Inc., one of the larger plating and anodizing firms in South Gate, Calif.

Thermacote Co., formerly a subsidiary of Holiday Plastics, Inc. of Kansas City, Mo., has been acquired by *Robert Vaillancourt* and has moved into new offices and plant at 108 South Delancy Ave., Pasadena, Calif.

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1—Hammond, 5 VRO, 5 H.P. variable speed, 1500-3000 RPM.
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2—Gardner, Type 3DB, double 7½ H.P. individual spindles.
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10—Backstand Idlers — Divine, Hammond, Portercable, Manderscheid.

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1—Used Crown, semi-automatic Plating Machine (rubber lined) complete with conveyor mechanism, lead heating coils and variable speed drive. Size of tank — 24' long x 52" wide x 42" deep.

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750/375	6/12	Excel
940	32	Elec. Prod.
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
1500	70	Century
2500/1250	6/12	Elec. Prod.
5000/2500	6/12	Columbia
5000/2500	9/18	Chandeysson

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2344	2" S.P.	Clarage
2500	½" S.P.	American
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THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

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1—8000/4000 Ampere, 6/12 Volt, Chandeysson, Synch.
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1—6000/3000 Ampere, 6/12 Volt, Electric Products, Synch.
1—5000/2500 Ampere, 9/18 Volt, Chandeysson, Synch., Exc.-in-head.
1—4000/2000 Ampere, 6/12 Volt, Chandeysson, Synch., Exc.-in-head.
4—3000/1500 Ampere, 12/24 Volt, Chandeysson, Exciter-in-head.
1—2500/1250 Ampere, 9/18 Volt, Electric Products, Synch., Exc.-in-head. 25°C.
1—2000/1000 Ampere, 6/12 volt, Hanson-Van Winkle-Munning.
1—1500/750 Ampere, 12/24 volt, Chandeysson, Synch., Exc.-in-head.

— ANODIZERS —

1—1000 Ampere, 40 Volt, Chandeysson, 25° C.
1—1000 Amp., 30 V., Ideal, Exc.-in-head.
1—750 Ampere, 60 Volt, Hanson-Van Winkle-Munning, Synch., Exc.-in-head.
1—500 Ampere, 25 Volt, Chandeysson, Synch., Exc.-in-head.
4—400 Ampere, 40 Volt, Separately Excited.

— RECTIFIERS —

1—2000/1000 Ampere, 6/12 Volt, G. E.
1—Green Selectoplater, 1800 Ampere, 12 Volt, 220/3/60.
1—1500/750 Ampere, 6/12 Volt, Udylite-Mallory.
4—1440/720 Ampere, 6/12 Volt, Udylite-Mallory.
1—750 Ampere, 12 Volt Self-Contained Selenium Udylite-Mallory.
1—Sel-Rex Selenium 1200 Amp., 6 Volts for 440/3/60.

— SPECIAL —

2—Crown & H-VW-M Centrifugal Dryers, #1 and #2, with heat.
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for chrome.
1—Udylite Semi-Automatic Plating Machine, for cyanide, size 19' long x 48" wide x 36" deep.
2—RONCI Enamelers, No. R-100 and R-200.
1—Almco DB-8 Deburring Barrel, 2-Compartment, Vari-Drive.
1—Almco DB-2 Deburring Barrel, lined.

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WINTER SPECIALS — PRICED RIGHT!

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1—La Salco Nickel Plating Barrel 36" cylinder w/hoist — rubber lined tank.
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2—Belke Tilting and Horizontal Tumblers wood lined, motor driven.
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1—Chandeysson Synchronous Motor Generator Set 6000/3000 amperes, 6/12 D.C. volts.
1—Duriron Heat Exchanger with pump and motor.
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1—1000 Amp., 6 Volt Hanson-Van Winkle

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1—2500/1250 Amp. H-V-W, 6/12 volts
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1—1600 Amp. General Electric, 24 volt
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New 5 H.P. Lathes $385.00; 7½ H.P. $445.00.

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Udylite 16" x 42" Lucite Cylinders, cleaning, pickling, plating & rinse line with 6-16" x 42" lucite cylinders, ideal for cadmium or zinc.
LaSalco 14" x 42" complete line, cleaning, plating, rinsing, melamine barrels.
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SITUATIONS OPEN—Technical representation wanted for Florida, Georgia, Washington, D. C. and New England areas. Consultants, sales engineers and specialists with contacts in aircraft, electronics, ship repair, and engine and machine industries, needed to handle specialized plating process requiring demonstration and instruction. Protected territories to proper parties. General plating suppliers need not apply. Write giving experience, territory and items now carried. Address: March 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

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SITUATION WANTED—Executive — 27 years industrial cleaning experience catering to metal processing and allied industries. Technical background. Excellent knowledge of formulations, consumer requirements, problems and techniques of selling and servicing industry. Available consultation and/or full time basis. Address: March 6, care Metal Finishing, 381 Broadway, Westwood, N. J.

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Dow Chemical Co., The Midland, Mich. 13, 41
Du-Lite Chemical Corp. Middletown, Conn.
Du Pont de Nemours & Co., E. I. Wilmington 98, Del. 30
Electro-Glo Co. 1430 S. Talman Ave., Chicago 8, Ill. 38
Electronic Rectifiers, Inc. 2102 Spann Ave., Indianapolis 3, Ind. 98
Enthone, Inc. 442 Elm St., New Haven 11, Conn. 3
Federated Metals Div., American Smelting & Refining Co. 120 Broadway, New York 5, N. Y. 78, 79
Forbes, W. D. 129 Sixth Ave., S.E., Minneapolis 14, Minn. 102
Formax Corp. 3171 Bellevue, Detroit 7, Mich. 74
Frank, Paul 118 E. 28th St., New York 16, N. Y.
G. S. Equipment Co. 15585 Brookpark Rd., Cleveland 11, Ohio 22, 40
Garfield Buff Co. 6 Clinton Rd., Caldwell, N. J. 104
General Electric Co. 1 River Rd., Schenectady 5, N. Y. 16, 17
Glo-Quartz Electric Heater Co., Inc. 4066 Erie St., Willoughby, Ohio 80
Graver Water Conditioning Co. 216 W. 14th St., New York 11, N. Y.
Grav-i-Flo Corp. 400 Norwood Ave., Sturgis, Mich.
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Gumm Chemical Co., Inc., Frederick 538-542 Forest St., Kearny, N. J. Inside Front Cover
Hamilton Emery & Corundum Co. Chester, Mass. 112
Hammond Machinery Builders, Inc. 1601 Douglas Ave., Kalamazoo 54, Mich. 73, 83
Handy & Harman 82 Fulton St., New York 38, N. Y. 87
Hanson-Van Winkle-Munning Co. Matawan, N. J. 77, 92A-D
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Harshaw Chemical Co., The 1945 E. 97th St., Cleveland 6, Ohio 10
Henderson Bros. Co. 136 S. Leonard St., Waterbury, Conn.
Holland & Sons, Inc., J. 475 Keap St., Brooklyn 11, N. Y. 114
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Hull & Co., Inc., R. O. 1303 Parsons Ct., Rocky River 16, Ohio 18
Illinois Water Treatment Co. 840 Cedar St., Rockford, Ill.
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Kushner, Joseph B. Stroudsburg, Pa. 112
Land, Inc., L. J. 146-148 Grand St., New York 13, N. Y. 114
Lasalco, Inc. 2818-38 Lasalle St., St. Louis 4, Mo. 19
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Lea Michigan, Inc. 14066 Stansbury Ave., Detroit 27, Mich.
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Metal & Thermit Corp. Rahway, N. J. 44, 36A
Michigan Buff Co. 3503 Gaylord Ave., Detroit 12, Mich. 113
Michigan Chrome & Chemical Co. 8615 Grinnell Ave., Detroit 13, Mich. 15
Miller Corp., Harry 4th & Bristol Sts., Philadelphia 40, Pa.
Mitchell-Bradford Chemical Co. Wampus Lane, Milford, Conn. 24
Motor Repair & Mfg. Co., The 1555 Hamilton Ave., Cleveland 14, Ohio 113
Murray-Way Corp. P. O. Box 180, Maple Rd. E., Birmingham, Mich. 91
Mutual Chemical Div., Allied Chemical & Dye Corp. 99 Park Ave., New York 16, N. Y. 6
Nankervis Co., Geo. L. 15300 Fullerton Ave., Detroit 27, Mich.
National Research Corp. Charlemont St., Newton Highlands 61, Mass.
Nazar Rubber Co., The 2727 Avondale, Toledo 7, Ohio 110
Northwest Chemical Co. 9310 Roselawn Ave., Detroit 4, Mich.
Norton Co. 1 New Bond St., Worcester 6, Mass.
Nuodex Products Co. 342 Madison Ave., New York, N. Y.
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Pfizer & Co., Inc., Chas. 630 Flushing Ave., Brooklyn 6, N. Y. 39
Platers Research Corp. 59 E. 4th St., New York 3, N. Y. 99
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Rapid Electric Co. 2891 Middletown Rd., Bronx 61, N. Y. 9
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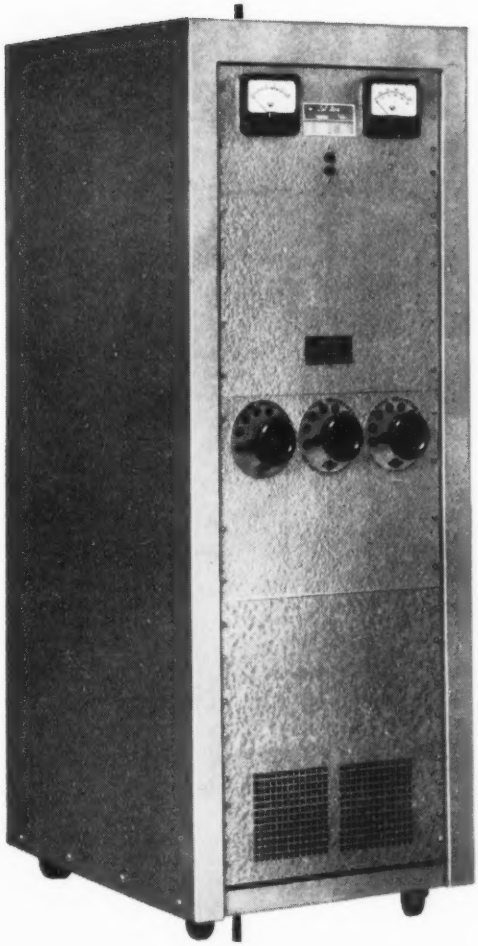

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